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The Amateur Greenhouse and Conservatory

Shirley Hibberd

THE

AMATEUR'S GREENHOUSE

AND

CONSERVATORY;

A HANDY GUIDE TO

THE CONSTRUCTION AND MANAGEMENT OF PLANT-HOUSES, AND THE SELECTION, CULTIVATION, AND IMPROVEMENT OF ORNAMENTAL GREENHOUSE AND CONSERVATORY PLANTS.

BY

SHIRLEY HIBBERD,

AUTHOR OF 'RUSTIC ADORNMENTS FOR HOMES OF TASTE,' 'BRAMBLES AND BAY LEAVES,' ETC.

Illustrated with Coloured Plates and Wood Engravings.

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THE AMATEUR'S

GREENHOUSE AND CONSERVATORY.

INTRODUCTION.

"Who loves a garden loves a greenhouse too.
Unconscious of a less propitious clime,
There blooms exotic beauty, warm and snug,
While the winds whistle and the snows descend.
* * * * *
All plants, of every leaf, that can endure
The winter's frown, if screened from his shrewd bite,
Live there, and prosper." COWPER.

THE briefness of the British summer and the frequent interruptions to out-door enjoyment, occasioned by adverse weather, render the well-kept plant house a place of most agreeable resort at every season of the year. The capabilities of our climate are truly wonderful, for we may, with a considerable degree of safety, enrich our gardens with plants that are natives of subtropical and arctic climes; and yet we find our varying selection of subjects seriously restricted unless we are aided by plant houses of some kind or other, to ensure for our favourites better conditions than the unprotected soil and free atmosphere would afford them. Hence, for pleasure and utility alike, the various structures that have been adopted as aids in plant-culture are of the utmost importance to the horticultural amateur, for they bring within the range of his observation and practice the vegetable products of climes that differ greatly in conditions from our own, and they may be so managed as to provide the best possible imitation of a perpetual spring, or of "summer all the year round."

The object of this little work is to afford some useful

information, systematically arranged, on those departments of plant-house construction and plant cultivation which may be properly considered under the general heads of the "greenhouse" and "conservatory," in which a temperate climate is maintained, as distinguished from the "stove," the "orchid-house," and other structures in which a tropical climate is required for the advantage of tropical plants. Considering the treacherous nature of our climate and the length of the winter season, it cannot be said we have as yet attained to a full knowledge of the value of glass in horticulture. Nevertheless immense progress has been made since glass and bricks and timber were rendered free of duty, and the vast number of patented plant houses and protective pits that are now in the market sufficiently prove that the demand for such has increased and is increasing. An amateur who purposes to provide some kind of glass structure to enlarge the uses and enhance the enjoyments of the garden may well be perplexed at first as to the best mode of procedure. The horticultural papers teem with advertisements of "portable," "imperishable," and "multum in parvo" plant houses, and with an almost endless variety of apparatus for heating. It will be found, however, on careful inspection, that in plan and material these do not greatly differ, and that in certain leading particulars they very nearly agree all round, so that a blind man could scarcely go wrong, except, perhaps, as to price, in making choice amongst them. But it is not every one who desires the latest patented invention turned out complete as from a bandbox. In one case an amateur may elect to be his own builder; in another there may be need to give a builder directions, and, perhaps, to watch over the work. One important condition of success, whatever be the mode of procedure, is that the amateur should have a clear idea of the sort of house required to suit the plants he intends to shelter in it.

The great point is to begin well, and the business of the writer of this will be to point out as clearly as possible how the desired end is to be secured, at the least possible expense, and with the greatest possible promise of a successful issue. Matters of fact will concern us chiefly, but matters of opinion will, perhaps, occasionally intrude and be governed always with good intentions, and seasoned with some little knowledge of the subject—sufficient, let us hope, for the purpose.

A disquisition on the nice distinctions that might be drawn

between the meanings of such terms as "stove," "hothouse," "greenhouse," and "conservatory," would serve no useful purpose. They are all plant houses, and depend for their distinctions quite as much on the furnishing and the management as upon structure and fittings. A house may be heated to 80° or 90° to-day for the comfort of orchids, and be called a stove. If we remove the orchids and put pelargoniums in their place, and lower the temperature to 40° or 50°, it becomes a greenhouse. We have but to enlarge it, and introduce camellias and acacias, and give the whole affair a somewhat elegant aspect, and it becomes a conservatory. These several terms are convenient because they refer to different things. But there is no occasion to define them precisely, and we might indeed go wrong were we to attempt the definition.



THE CRIMSON-LEAVED PALM.
(*Welfia regia.*)

CHAPTER I.

THE CONSTRUCTION OF THE PLANT HOUSE.

BEFORE we begin to construct, we must determine on the site. Now, a bold beginning may be made by the assertion that any site will suit for a plant house, provided the owner will furnish it with plants adapted to the site, and resolve never to make selections without first considering the suitability of the house for their protection. Suppose we have a high damp wall facing north, and wish to cover in the space in front of it with glass for plant-growing. It may be a prudent proceeding to erect there a substantial lean-to, and to construct against the face of the wall inside the house a rockery, and plant the rockery with ferns, and make a lovely scene rich in botanical interest. Or suppose the wall faces south and the position is particularly dry and hot, we may still proceed to cover the space in front with a lean-to, and make a border next the wall for climbers that love sun and a stage in front for a collection of succulents, which never flourish so well as in a "roasting situation." Or we may plant vines outside and train them up the rafters, and winter all the bedding plants on stages or beds of earth supported by brickwork in the centre. The question of accessibility is of the utmost importance. You will not care to walk far through wind and rain, perhaps, to see the first flowers of the primulas and hyacinths, or to cull bouquets for the friends who will visit you on New Year's day; nor on a night of keen frost and falling snow will you benefit your health by walking long journeys to stir up the fading fire on which the lives of your pets depend. Think of these things in time, and if your own health does not enter into the question, be not quite oblivious of the health of the gardener. Not only is the position of the house important, but that also of the stoke-hole and furnace, if artificial heat is employed. Where it is possible to

place the furnace under cover and in close proximity to a yard where the fuel is stored, the worst of the winter work will be greatly facilitated, and the owner's purse will be saved. A furnace under cover will afford more heat for your consumption of fuel than one exposed to the wintry blast, and the gardener will not so much dread the task of stoking on a bitter winter night as he will be likely to do in the case where the glare of the fire and the blinding snow assail his eyes at the same time, and his fingers are frozen at the very moment that his face is flushed with looking into the disposition of the burning fuel.

In the construction of a plant house the first matter of importance is to determine the purpose to which it is to be applied. On this will depend the choice of site and aspect, the size of the house, and the extent to which embellishments are to be employed within and without. It will be well for those who study economy to remember that a very plain substantial house, thoroughly adapted for plant culture, will always look respectable, even if it is not decorated like a pavilion or pagoda; and its use will justify it far more satisfactorily than any amount of ornament. There are some grand conservatories in the land in which nothing of a vegetable nature except mildew will thrive, and not a few very humble greenhouses in which plants grow as if by magic, and provide their owners with an endless variety of priceless (though costless) pleasures. The idle man who does not intend to do much in the gardening way may be wise to build himself a roomy and thoroughly substantial conservatory, attached to or very near his dwelling, and furnish it with dracænas, yuccas, agaves, and dasylirions. An ambitious amateur may set his mind upon a block of houses for camellias, heaths, cacti, pelargoniums, and fifty other classes of plants. This one would do well to consult a garden architect, and determine from the first to do the thing well or not at all. But for every one who requires to be accommodated in a peculiar way there will be hundreds who want what is commonly understood as a greenhouse, and the question is, How are they to begin?

A good general advice to all such would be to erect for the present one good span-roofed house, running north and south, in a quite open sunny spot, and have it as large as the purse will allow for the whole thing to be done properly. A large body of air maintains an equable temperature with far less trouble of management than a small body, and hence in a burst of

unseasonable heat in spring, or a sudden accession of intense frost in winter, the plants in a large house will be likely to suffer less than plants of the same kinds in a small house, both receiving equal care and attention. By the term "large house" is not to be understood anything extravagant, but a fair roomy structure, with as low a roof as is consistent with the comfort of the cultivator and the size of the plants to be kept in it. If you employ an architect or builder not practically versed in the construction of plant houses to carry out your wishes, you will probably obtain for an extravagant outlay a heavy structure with a lofty roof, in which nothing worth having can be persuaded to grow. Keep the roof down to something like the actual requirements of the plants, for the nearer they are to the glass the better. The lofty roof is one of the most dangerous delusions the beginner in gardening has to guard against when the question arises about the employment of glass.

It must be repeated that the purpose is the matter of first importance. Heaths, geraniums, and camellias will not submit to the same routine of treatment the whole year round, and at the end of that time present equal indications of health and vigour. The heaths and other "hard-wooded" plants usually associated with them require abundance of light and air, and very little warmth in winter. The camellias are not benefited by such a blaze of light or free current of air as the heaths require. The geraniums require more warmth in winter than either, and all the light they can have, with the ventilation so modified that they suffer nothing from the keen winds and freezing showers of early spring. Now, the amateur may be inclined to ask if every class of plants is to have a house to itself? the answer is, No. In a well-built span-roofed house with brick sides, low roof, ample ventilation, and a sufficient service of hot-water pipes, a very miscellaneous assemblage of plants, including some that properly belong to the stove, may be grown by one who has acquired a little experience. But if the amateur has a particular object in view—such, for instance, as to excel in the production of oranges, exotic ferns, the smaller succulents, &c. &c.—then he must provide accommodation in accordance with the requirements of his special pets, and the odd things must take their chance with the help of such little aids as can always be rendered amid adverse *circumstances.*

Premising that a well-built house of small dimensions is to be preferred to a badly-built house of great extent, it may be well to suggest that it is a very easy matter to lengthen a house, but a rather difficult matter to increase its width. Therefore let the house be wide enough in the first instance, as you may increase its length to any extent that your land and purse will allow. It is well also to select, if possible, a site adapted for a range of houses, should it be some day hence determined to increase the area of glass. We never know what our desires and intentions may be to-morrow or the day after next, and therefore, though it may seem at this moment that the greenhouse in course of erection will suffice for the rest of our lives, we may in a year or so propose to build another, and perhaps yet another, and be compelled to plant them in all sorts of odd corners, where they will be difficult to get at, and, perhaps, impossible to heat them all with one boiler. A systematic and conveniently arranged group of substantial plant houses, however plain and unpretending, are a credit to any garden, but houses of all shapes and sizes, flung all over the place, as if sown by the tempest, are not creditable, and it will be a wonderful thing indeed if they do not prove to be as inefficient as they are inconvenient. A greenhouse in a corner may be snug and useful, but for superior plant-growing there is nothing like a roomy and airy space on a dry subsoil, or, if the situation is low and damp, on a raised and well-drained platform.

The span-roofed house with low pitch of roof is to be preferred for all general purposes; but the lean-to is not to be despised. One advantage of the lean-to is that it turns to good account the shelter and warmth of an existing wall, and in proportion to the covered area is cheaper than a span. It is not an easy matter to grow perfect specimen plants in a lean-to roofed house, and it is not always possible to ventilate such a house with equal ease and efficiency as a span of the same area. But what we lose in one way we gain in another; and a lean-to with long rafters resting on a high and stout wall, with a south aspect, may be made much of as a vinery, and produce first-rate grapes, without the expenditure of so much as a farthing in seven years on artificial heat. The best house we have ever had for substantial work of the useful kind—for keeping and propagating bedders, for the production of grapes and cucumbers, for safe keeping of a number of stove-plants, and for growing tomatoes and melons—was a lean-to with a low roof

and walk sunk below the level, the back wall of which was built of old floor-boards placed double, and filled in between with sawdust.

A number of minor improvements have been adopted of late years in the construction of plant houses, the effect of which has been to cheapen them considerably, without impairing, and in some instances actually improving, their efficiency. We say nothing now of patented ventilators and such like, for it occurs to us to mention, first of all, that heavy rafters and sliding lights have become almost obsolete. It is found that side ventilators are in many instances sufficient; but where roof ventilation is required in addition it may be obtained in a much cheaper and more simple way than by the adoption of sliding sashes. Separate squares of glass may be hung on hinges, or narrow-hinged lights may be inserted at intervals. The disuse of heavy rafters, in consequence of their being no longer required to carry sliding lights, allows of the use, throughout, of light sash-bars, carrying larger glass than was ever used for the purpose until within the past few years. Thus a more complete flood of light is obtained than was possible in the old-fashioned houses, while the ventilation is more perfect and far less cumbrous. As for the glass, it should be good English, weighing twenty-one ounces to the square foot. The low-priced Belgian glass is quite unfit for a plant house, however well it may be adapted for sheds and workshops; its numerous specks and bubbles act as burning glasses on the leaves beneath them, and the result is brown spots, holes, and other disfigurements.

There will still arise, perhaps, in the mind of the amateur a number of questions as to the particulars of the construction of the house required. The proper angle of the roof may be one of them, and that is by no means a matter of trifling import. For all general purposes the flatter the roof the better, because it will conduce to the short healthy growth of the plants, if they are placed as near the glass as possible; but there are two serious objections to the adoption of a low angle. It incurs a liability to drip, and it provides a playground for cats in a district where those interesting quadrupeds abound. We once suffered in a frightful manner through the breaking of a pane of glass on a low-roofed house when a party of cats were holding an out-door nocturnal demonstration upon it. They fell in and went mad with fright, and committed such

havoc as for the time nearly broke our heart. The amateur in town must protect his interests, if his plant houses have low-angled roofs, by covering them at the distance of a foot from the glass with a "cat proof" wire-net, or adorning the woodwork everywhere with a miniature *chevaux de frise*. It must be repeated that for general purposes the flatter the roof the better, especially for mixed collections and bedding plants. But if it is requisite to catch the earliest rays of the morning sun in the opening spring, a lean-to with a south-east aspect



"Tom, away; mark the high noises."—*King Lear.*

and a steep pitch is to be preferred. Therefore, in building an early vinery a nearly flat roof is of all things to be avoided. In any case, if "doctors disagree," and the angle of the intended roof becomes a question dangerous to anybody's peace of mind, it may be settled safely by the figure 45, for that is the angle which affords the best compromise, and most safely subserves a number of purposes.

In fitting the interior we begin with a good paving of red foot-tiles, or something equally good and cheap obtainable in the locality. With mosaic and other fanciful pavements we have nothing to do, for the simple reason that they are costly.

There is nothing so good for a stage in summer as large slates, and nothing so good in winter as open wood-work. The houses in which we keep miscellaneous plants have slate stages on each side the centre walk. When affairs are made up for the winter a substantial wood trellis is laid over the slates at a



"Unheedful, desperate, wild adventure."—1 *Hen. VI.*

few inches distance, to allow of a free circulation of air around and under the pots. The trellis is made in convenient lengths and consists of deal bars two and a half inches wide, three quarters of an inch thick, set one inch apart, with cross-bars to brace them together. In any case the staging must be so arranged as to bring the plants as near as possible to the glass. The subjoined diagrams represent a good and a bad way of fixing the staging.

In fig. 1 is represented one side of a low-roofed span (A), and flat staging near the glass (B). This is a good arrangement. In fig. 2 is represented one side of a steep-roofed span (A), and rising stage (B). This is a very bad arrangement. The central path being in the line A B, the plants are very conveniently placed both for seeing and getting at them, but

the lowest are so far from the glass that they must be drawn and blanched and miserable.

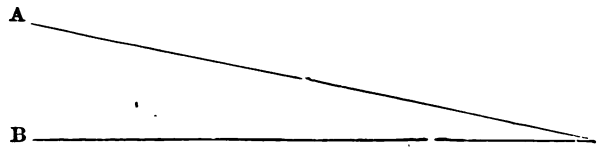


Fig. 1.

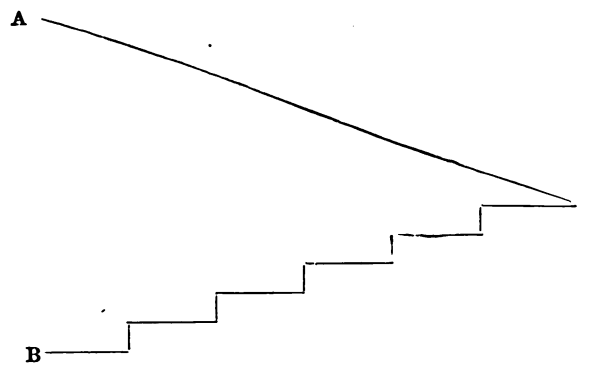


Fig. 2.

The question of material is one of comparatively small importance, because houses of equal value as regards plant production may be secured in either iron or wood, and with either brick or stone or concrete walls. But of necessity there may arise occasions for particular care as to selection of materials, and a few remarks on this part of the subject will be appropriate in this place. To begin with:—at ground line, the question arises, shall we have walls or glass only from head to foot? The Paxtonian houses consist of lights resting in a wooden trough which catches and carries away the rain water, and the thrust of the rafters is received by "chairs" or rests of wood which lodge on blocks of concrete or stone sunk in the ground. Between walls of brick and wood the difference is all in favour

of the former as to protective power and duration, but in favour of the latter as to lowness of first cost. As to rafters, those of wood are more perishable than iron, and admit less light. On the other hand, wood is a non-conducting substance, and if a nice comparison were made it would be found that a house with a light iron roof would cost rather more for fuel than a house of the same shape and dimensions with wood rafters, to maintain an equal temperature throughout the winter. But light is life, and iron roofs are adapted to catch the utmost glimmer of the weak daylight of this cloudy clime, and in the case of a structure intended for succulent plants, and such other subjects as need the fullest possible flood of light, iron is certainly to be preferred. In the case of a large conservatory iron is unquestionably superior to wood, and the more so with every advance in elegance of construction.



PARANEPHELIUS UNIFLORUS.

CHAPTER II.

HEATING THE PLANT HOUSE.

THE heating of plant-houses presents a difficulty proportioned to their size in an inverse geometrical ratio. To put the case in another way, it may be said, that the larger the house or group of houses to be heated the more easily may the desired end be accomplished, but the smaller the house the more difficult the task. In the preceding chapter it is remarked that the atmosphere of a small house is quickly influenced by changes of external temperature; and here it may be added that it is equally soon affected by the action of any kind of heating apparatus. Hence, the amateur who finds his plants hard frozen may light a fire to save their lives, and actually roast them to death in an hour or two, through indiscreet management. Nevertheless, the amateur who has but one small house need not be discouraged by this statement, for it is a part of the ostensible purpose of this book to render aid in this extreme but not uncommon case, as well as in the broader subject of heating in general.

It is of the utmost importance that the mode of heating should be thought of when a plant-house is designed in the first instance, because heat is generated and diffused, in accordance with fixed laws, to which all our arrangements must conform. Thus, if we build a house in a low, swampy position it will be found a difficult matter to give it the benefit of artificial heat by any means whatever, because as heat *ascends* from the level at which it is produced, it follows that the heat generator or furnace must be placed at a lower level than the house itself, and, in the case of a house in a swamp, the only place for the furnace will be in the water. This is another extreme case for which, so far as the laws of nature permit, we shall endeavour to provide; and it is cited simply for the purpose of impressing the amateur plant-grower with the neces-

sity of considering the subject of heating coincidently with the construction of the houses.

THE FLUE SYSTEM.—The simplest method of heating is by means of a furnace and brick flue. Every skilled bricklayer knows how to heat a house by this method, but it is well that those who have to pay and take the consequences should know something about it also. It is necessary, in the first place, to provide a sufficiently capacious stoke-hole at the end of the house, or, in the case of a lean-to, behind the back wall. This must be sunk below the level, and there must be a decided rise from the fire to the flue, to enable the draught to overcome the check which the heat encounters in taking the horizontal course of the flue. The simplest arrangement in the case of a lean-to is to take the flue along the front of the house, rising slightly all the way, and terminating in a chimney at the other end. In the case of a span-roofed house it will be desirable to take the flue round the house, rising gently all the way, and terminating in a chimney over the furnace. It will be understood that the necessity of a continuous rise of the flue renders it desirable to place the furnace low enough in the first instance. It is desirable to detach the flue at every point from the floor of the house by means of piers, to allow of a circulation of air around the whole exterior of the flue, and promote a consequent equable distribution of the heat. A small flue of four-inch or six-inch drain-pipes, well cemented at the joints, may suffice for a small house, but what we should consider a good flue would be two feet high and one foot wide, the sides of brickwork, and the top and bottom red foot tiles or slates. A serviceable flue, however, may be made eight inches wide and sixteen inches deep, and in any case the depth should exceed the width, or it will not draw well. It is a good plan to plaster the flue on the outside, to prevent the escape of smoke, but this is not needed if it is well built, and it certainly does slightly check the communication of heat to the house for the first hour or so after the fire is lighted. A trough for water on the top of the flue should be provided. In some districts tiles, with sunken surfaces, may be obtained for this purpose, but a cistern of zinc or iron is everywhere obtainable. But whoever can construct a flue will find no difficulty in securing an evaporation of water from the top of it. The kind of fuel to be burned will, in some degree, determine the size and material of the flue, for the

greater the production of soot, the more frequent the necessity of cleansing, and the smaller the flue in that case, the more troublesome will it be to keep it in order. In any case, however, periodical cleansing must be provided for, and for the flue of average capacity, iron soot doors answer best, or common flagstones may be employed. These should be inserted at the end of every straight line of flue; consequently, wherever the flue turns will be the place for a soot door or something equivalent thereto.

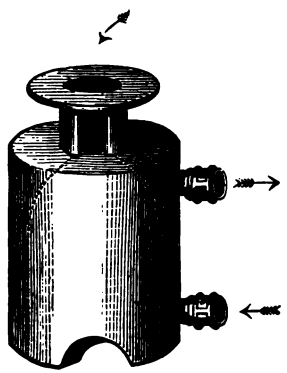
The furnace should be of brick, with double iron doors, and a damper above in the first part of the flue, and a valve in the door of the ashpit for regulating the draught. In determining the dimensions it is well to remember that a comparatively large fire burning slowly is to be preferred to a small fire with a brisk draught. But here, again, the nature of the fuel to be burnt must also be considered, for if it is of a kind that produces little smoke, the opening in front may be dispensed with. It is well, however, to provide for any kind of fuel, and especially for the consumption of the waste fuel of the household, for the cinders the servants "get rid" of will, in many places, suffice for the preservation of a good collection of plants.

The flue system is now rarely adopted, having been in a great measure superseded by the hot water system, which will next be described. Plenty of good plant growing has been accomplished by means of flues, but they occupy much space, and are liable to crack and emit sulphureous fumes, to the sudden destruction of the plants they are intended to preserve.

The Hot-water System is so generally adopted that there are as many plans of apparatus provided for it as there are days in the year, and, as a matter of course, everybody's boiler is the best. To a beginner in hothouse practice the variety of boilers must be extremely perplexing, but it will soon be found that they differ but little in essential particulars. In every case there is a furnace beneath a boiler or in the centre of it, and from the boiler proceed iron pipes, laid horizontally around and about the house. The heated water passes out of the top of the boiler into what is called the "flow" pipe, and having traversed the length of the house comes back to the bottom of the boiler by what is called the "return" pipe, and this motion of the water is described as the "circulation." It is analogous

to the circulation of the blood in the body—the fuel is the food, the fire is the life, the boiler is the heart, the flow pipe the aorta, and its ramifications the arteries; the return pipe is the vena cava and its ramifications the veins.

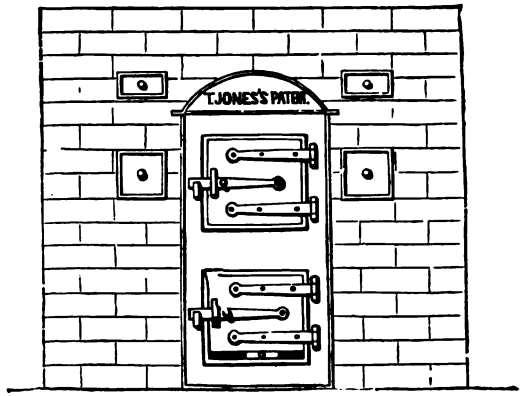
In making a selection of a boiler it is of the utmost importance to ensure greater power than will be required under ordinary circumstances, and in the case of an extensive range of houses there should be two boilers, and they should be in use alternately during periods of a month or so at a time. In case of an accident to one of them—and the best boilers will at times break down—there is another ready for use, and with all



CONICAL BOILER WITH FEEDING TOP.
(Thames Bank Iron Company.)

connections complete, so that the turning of a valve and the lighting of a fire are sufficient to save the plants from destruction. We have seen a collection of plants, valued at some thousands of pounds, destroyed through the breaking down of a boiler in a season of intense frost, and at a moment of festivity when no one was prepared for such an emergency.

The simplest form of boiler for a small house is the Upright Conical, which consists of a furnace communicating with an upright chimney through the boiler, which is an upright cylinder not necessarily of a "conical" form. This may be used without any brick setting, but is far more serviceable with setting than without it, because of the great power of brick-*work to prevent* waste of heat. One great advantage of this form



JONES'S TERMINAL SADDLE-BOILER.
Fig. 1.—Front View when in operation.



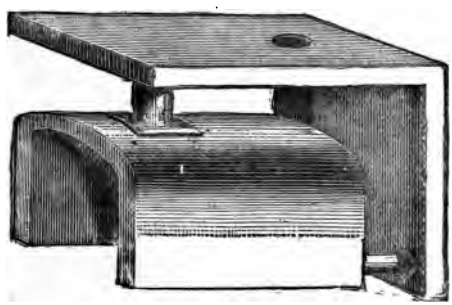
JONES'S TERMINAL SADDLE BOILER.
Fig. 2.—Sectional View showing the course of the circulation.



JONES'S TERMINAL BOILER.
Fig. 3.—Boiler detached from the brick setting.

of boiler is the small space it occupies, and another advantage is that it can be so arranged as to continue burning many hours without attention, a most important matter in a garden where labour is not largely employed. One of the best forms of the conical boiler is that manufactured by the Thames Bank Iron Company, Upper Ground Street, London.

The most generally useful boiler, whether for heating one house or a range of houses, is the Saddle, of which there are many forms, but all of them are variations of an arch or saddle, the interior of which is appropriated to the fire, while the exterior contains the water. The horizontal course of the draught moderates its force, and tends rather in the direction of slow than of fast combustion; but the saddle is not to be regarded as a "slow combustion" boiler, in the proper sense of that term; it is simply not rapid, and hence does not require frequent attention. The great power of these boilers, and the fact that—to use a gardener's phrase—they will "burn anything," are their two principal merits, but it must be added that they do not require to be set any great depth below the course of the pipes, and they are remarkaby economical in respect of consumption of fuel, in consequence of slow but perfect combustion. Amongst the best forms of saddle boilers mention may properly be made of the Cannon, which is cylindrical; the Flat Saddle of the Thames Bank Iron Company; the Terminal, made by Mr. Jones, of David Street,



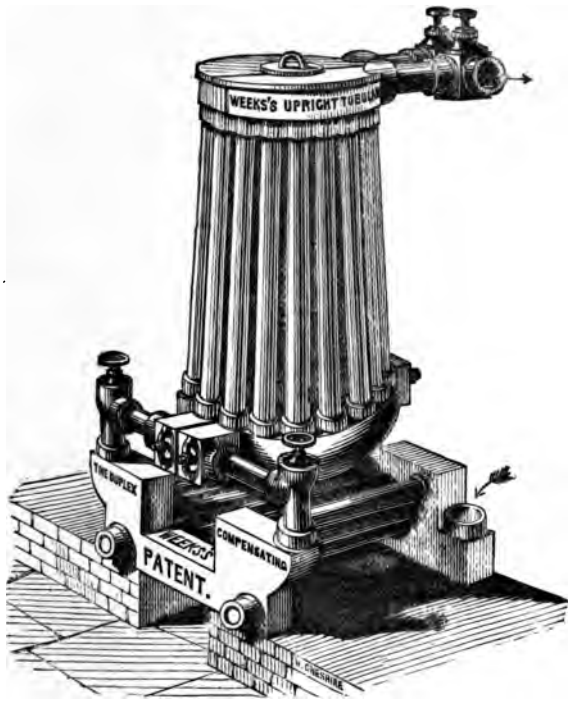
JONES'S DOUBLE L SADDLE-BOILER.

Manchester; and the Double L, made by Messrs. Jones and Son, of 6, Bankside, London.

If a final choice is to be made amongst these, we shall vote

for either of the last two, as they are well contrived to catch up the heat which is apt to accumulate at the end of the saddle furnace, and thus ensure a quicker circulation and greater economy of fuel than other forms of the saddle.

The most powerful and hence best adapted for extensive ranges of houses are those known as Upright Tubular boilers. If, instead of an upright water jacket enclosing the fire, as in the



WEEK'S UPRIGHT TUBULAR BOILER.

conical boiler, we provide a series of upright tubes, and allow the fire to play amongst and around them, the result will be a tremendous increase of power and a proportionate increase of the consumption of fuel. In great undertakings in the way

of plant growing, whether in private or public gardens, the upright tubular is usually employed, as in emergencies it is capable of an almost instantaneous effect, while for every-day work it is valued for its great power, a tubular boiler of a given size being capable of heating to a given degree ten or twenty times the extent of pipe that any other boiler of equal size would heat to the same degree. Messrs. Weeks and Co., of King's Road, Chelsea, have developed the capabilities of this form of boiler to an extent which entitles them to the first place in this department of engineering. Their "One-boiler system" renders one boiler sufficient for any number of connected or separate plant houses, even though to heat them sufficiently several miles of pipes may be required; and their Duplex tubular boiler is so constructed that, in case of an accident to any part of it, that part can be instantly detached, and the heating business, instead of breaking down, as it would with any other boiler, proceeds without interruption, or, at the most, with the interruption only of the interval between the occurrence of the flaw and the operation of detaching the portion of the boiler in which it has occurred.

The most suitable boiler having been selected, the business of setting and attaching pipes is a matter of the simplest mechanism. But mistakes occur, and a few words of advice may be useful on these and other matters. Be sure that the workmen who are to set the boiler know what they have to do. It would be simply absurd for us to describe how each particular boiler is to be set, and if the manufacturer undertakes the work it will be properly done. But a second-hand boiler may be purchased, and the village smith or bricklayer have the job of setting and attaching pipes. It should be understood, then, that a decided rise of the pipes from the level of the boiler to the level of their extreme distance from it is necessary to ensure a good circulation. The rise should be gradual but continuous, and at the highest point where the flow ends and the return begins, a reed-like pipe should be inserted to promote escape of air, which might blow the whole affair to pieces if allowed to accumulate without means of egress. In a heating system of any extent there should be several air-pipes inserted. The feeding cistern should be on a level with the highest point of the extreme end of the flow-pipe or a few inches higher. It must not be lower on any account, *or the* water will never reach that point, and there will be no

circulation. It is common in stoves where a moist heat is required to place several feed cisterns over the flow-pipe to promote evaporation. It only needs to here mention that "water will find its level" to render all these considerations as simple as A B C, and, whether or no, the recognition of this law of nature is the essence of hot-water engineering.

In the adoption of pipes, those of one or two-inch bore are adapted for small houses, and for subsidiary systems in heating parts of houses, such as propagating compartments. But the teachings of experience are all in favour of four-inch pipes for all ordinary purposes, and of two-inch or three-inch pipes for any part of a system where the heat has simply to be conveyed and not diffused, as in the intervals between houses that are heated from the same boiler. In the fitting of the pipes there is nothing so good and cheap as rings of india rubber, which are placed over the end of each length, and then driven with it into the socket. If these are of the right size and the pipes are properly forced home with the rings, &c., there is no occasion for cement or any kind of waterproof stopping. There may be a leakage here and there for a week or so, but it will cease without requiring help, and the joints will keep for a lifetime.

In setting boilers of all kinds the size of the flues must be regulated according to the fuel to be employed. If coal is to be used they should be half a size larger than would be desirable for coke, or they will be soon choked up with soot. The pipes should be laid above the level in all cases, if possible, for if they dip anywhere, as, for example, to pass under a doorway or a path, there will be great loss of heat, and it will be impossible to get up a heat quickly. Have plenty of piping, for there is no economy in a stint. In setting a saddle it is well to place it on a row of fire bricks, to afford more space for fuel. This is especially necessary when the fire has to be made up to last some time. "Driving" is a detestable practice, and should only be resorted to in emergencies. A large steady fire is far more economical as to consumption of fuel than a small fire with a quick draught, for the stronger the draught the greater the quantity of cold air from without, as well as water within, to be heated. Careful stoking is required for all tubular boilers, on account of the exposure of the tubes to the fire; hence, in a place where things are done roughly, the saddle form is to be preferred.

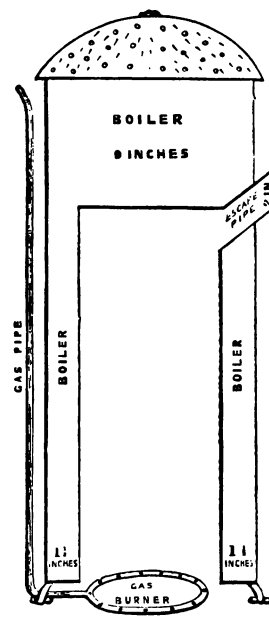
GAS-HEATING.—The heating of houses by means of gas is a modification of the hot-water system above described, and should, as far as possible, be conducted on precisely the same principles, the fuel being gas instead of wood, coal, coke, or charcoal. There are several kinds of gas apparatus in use, and there is now no difficulty in heating a plant house in an efficient manner, provided only that the proprietor is prepared to employ experienced engineers and pay the extra cost of fuel, for gas is the most expensive of materials employed for the purpose of *heating*, though it is the cheapest for the purpose of *lighting*.

The principal advantage of gas-heating is that stoking is dispensed with, and, if the pressure in the pipes is pretty constant, the apparatus may be left for many hours without attention, as the heat given off will be constant, and to a great extent determinable beforehand. It must not be concealed, however, that to manage a gas-heating apparatus requires some amount of experience, and those who would succeed must habituate themselves to observation, not only of the action of the apparatus, but of its influence on the temperature of the house at different hours and in different states of the weather. A body of flame sufficing only to keep out frost on a frosty night with a clear sky might suffice to raise the temperature of the house to 70° or 80° on a mild night with a cloudy sky, and, as a matter of course, alternations so great and sudden would seriously injure the plants the apparatus was intended to preserve. Granting, then, that the adoption of a system of gas-heating will not absolve the amateur from responsibility to attend to its management, the next question is, what form of apparatus is the most to be desired?

The simplest form of gas-heating apparatus consists of a ring of jets *burning blue*, through wire-gauze, under a small vessel filled with water, over which is placed a vertical pipe, the mouth of which expands like a hood over the whole affair, to catch and carry into the air without all the products of combustion. This has the advantage of extreme simplicity, and the disadvantage that it is slightly injurious to nearly all kinds of plants, but especially so to camellias, oranges, and other winter-flowering subjects. But for preserving bedding plants and ferns, and other quick-growing subjects, it answers very well; for, being in use only when severe frost compels the temporary employment of heat, the injury done is trifling, and

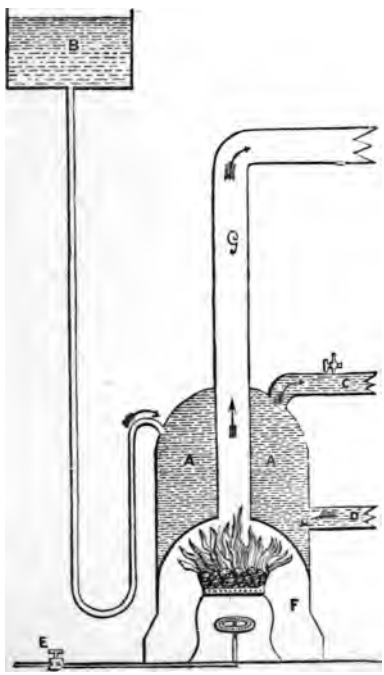
the plants soon recover from it when the growing days of spring return. A merely common gas-flame is, however, not to be tolerated in a plant house, except in the way of a few small jets to afford light, and these are always allowable, the minuteness of the combustion exercising so minute an influence as to be practically of no consequence whatever.

The best form of apparatus is that which consists of boiler and circulating pipes, and it is always advisable to place the boiler *in a separate apartment*, even if a portion of the plant house has to be screened off by means of glass for the purpose. However careful we may be to provide ready exit for the products of combustion, a gas-flame of sufficient power to afford the amount of heat required must prove prejudicial to plants when in close proximity to them. It commonly happens, however, that the house best adapted for gas-heating occupies a position adjacent to an entrance-hall or some other apartment, in which the boiler can be placed for both use and ornament. It must not be forgotten either that a boiler adapted for the purpose can be placed as well *beneath* as *beside* the conservatory to be heated, for the pipes in which the water circulates may range vertically or horizontally at discretion, provided the work is well done. In many cases a gas apparatus might be adapted to heat a bath-room and a plant house, and afford the additional convenience of management within doors, without any occasion for exposure to the night air in the winter season.



A simple and effective form of gas-stove is that known as Trotman's, which is manufactured by Mr. Trotman, of Isleworth. The stove stands about thirty inches to the top of the lid; the diameter nine inches. The centre to within six inches

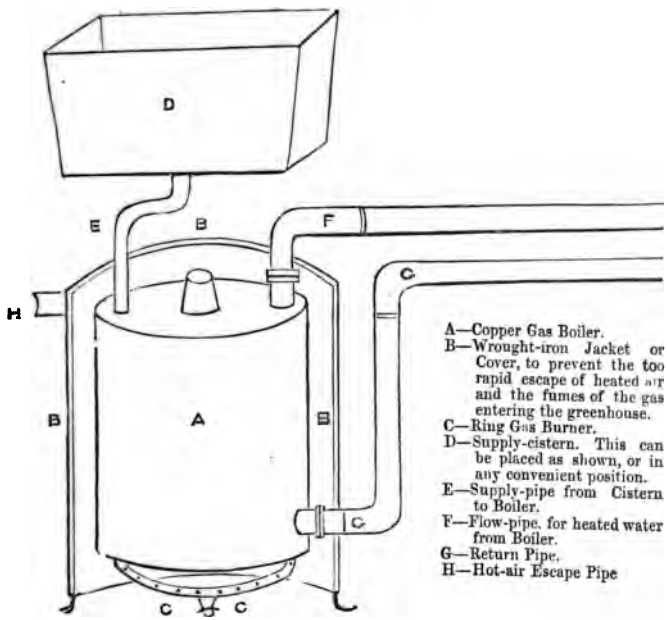
of the top is hollow, so that the flame of the burner is in the centre of the water, thus economising the heat. The foul air passes away by a pipe through the water, and afterwards can be carried about the house as convenient, but must not be carried horizontally, or there will be a likelihood of a back draught. The pipe produces a considerable amount of heat, and is no more objectionable than a common flue, hence it may be used to heat the back wall, or run under a stage. The heat from the stove itself is the same as any other hot-water apparatus. The lid is perforated, and the moisture thus obtained will counteract the dry heat from the pipe. There is no escape of foul air whatever if properly set. Its simplicity is one great recommendation wherever gas is available, as it is the cleanest and least troublesome of any method of heating small greenhouses.



The subjoined sketch may be accepted as a plan which any skilled workman may carry into effect without infringing any one's patent, or treading on anybody's toes.

The apparatus consists of an iron or copper boiler (A), through which passes a hot-air funnel (G). The boiler is supplied by a small pipe from an open cistern in the house (B), entering the boiler at the bent arrow. The heat is derived from a small furnace formed of a circular hoop of iron with a bottom of wire gauze (F). The furnace is filled with lumps of pumice stone, and is supplied with a gas burner placed below the

wire gauze, and the gas passes up through the pumice stone, and is there lighted. There are two distinct sources of heat, one by the flow-pipe (C), which passes round the house and returns to the boiler at D, and the other by means of the hot-air pipe (G), which is carried along under a shelf against the back wall, and then out of the house at the other end. The only precaution necessary is to prevent an accumulation of air in the boiler or pipes, and every time the gas is lighted, the stop-cock at C should be opened to allow of its escape. The heat should at first be very slight, and may be increased as the circulation is established.



GAS-HEATING APPARATUS OF THAMES BANK IRON COMPANY.
(Boiler 10 inches high, 9 inches diameter.)

Probably the best gas-heating apparatus now before the public is that manufactured by the Thames Bank Iron Company. The apparatus consists of a boiler (A), capable of heat-

ing fifty feet of four-inch pipe; it is encased in a wrought-iron jacket, which serves the purpose of a brick setting; the iron jacket, with escape pipe (H), renders it perfectly safe to use this boiler *inside the house*, as it is impossible for the fumes to affect the plants. The hot air escape pipe might be carried round the house, and it would be an advantage if it terminated in one of the chimnies of the dwelling-house.

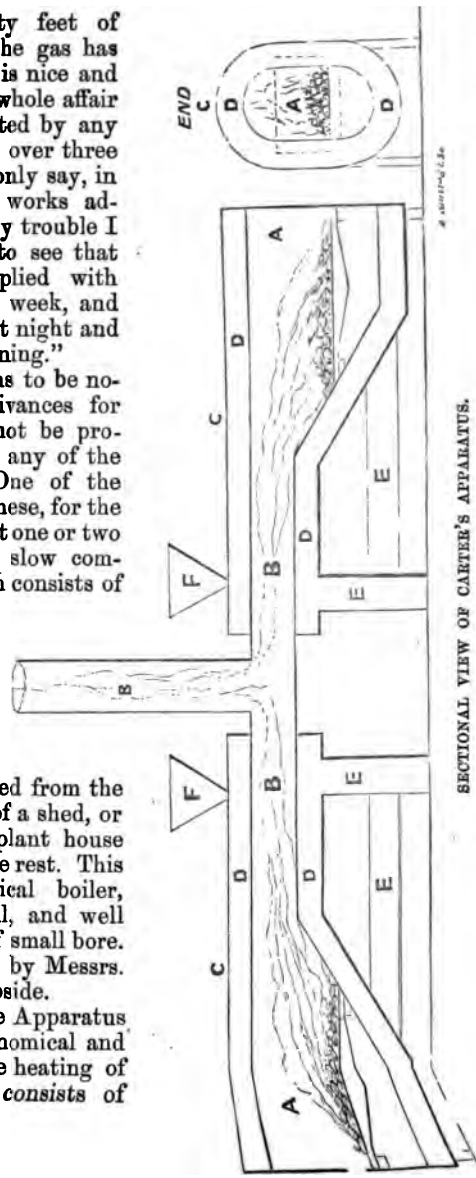
A correspondent of the 'Floral World' describes a gas-heating apparatus which any skilled workman could manufacture at a very small cost. He says:

"The size of my house is twelve feet by nine feet, and it stands about thirty yards distant from the cellar, in which the gas-meter is fixed. I have a three-quarter-inch iron pipe running from the meter close to the front of the house. I thought it best to have rather a large size pipe to conduct the gas, as the water will sometimes condense in pipes in the winter time; and, of course, if the pipes are of small size, there is more danger of the gas going out. I have a small sheet-iron box, about fifteen inches square, which is fixed inside the house, close to where the gaspipe comes, and proceeding from the top of the box is some two-inch stove piping, to carry away the fumes of the gas through the roof into the open air. The box is made so that there can be no escape of the fumes into the house. Inside of the box there is a small saddle-shaped copper boiler, which holds just five pints, and, proceeding from the top of the boiler, and through the top of the box or cover, is a piece of one-inch lead pipe, which is carried straight for about two feet, and then bent down and attached to a one-inch iron pipe which runs round the house, and which returns again through the box into the boiler at the bottom. Under the boiler is fixed a small Bunsen burner gas stove (which any gasfitter will supply). To prevent the fumes of the gas getting into the house, I have a small door in front of the iron box, so that I can light it from the outside. The cistern is fixed just at the bend of the flow-pipe, the furthest point from the boiler, with a tap to turn the water on or off, although I always leave it on; and at the same point I have a bit of thin composition piping fixed in the iron pipe, and carried out into the open air as a kind of safety-valve. A small tap, which is fixed in the pipe at the highest point just over the boiler, must be turned on before the gas is lit, to allow the air to escape out of the pipes, or the water will not circulate. I

have nearly seventy feet of piping, and, after the gas has been lit an hour it is nice and hot all round. The whole affair can be made and fitted by any gasfitter for a little over three pounds, and I can only say, in conclusion, that it works admirably, and the only trouble I have met with is, to see that the cistern is supplied with water about once a week, and to turn the gas on at night and off again in the morning."

There yet remains to be noticed a few contrivances for heating which cannot be properly ranked under any of the foregoing heads. One of the most important of these, for the amateur who has but one or two houses, is Riddell's slow combustion boiler, which consists of furnace and water jacket, constructed of iron, and needing no brick-setting, although, in common with all other boilers, it should be sheltered from the weather by means of a shed, or in one end of the plant house screened off from the rest. This is a very economical boiler, quick and powerful, and well adapted for pipes of small bore. It is manufactured by Messrs. Riddell, 155, Cheapside.

Carter's Portable Apparatus has been found economical and trustworthy for the heating of small *houses. It consists* of



SECTIONAL VIEW OF CARTER'S APPARATUS.

a fireplace (A) closed in front with a regulator to ashpit door to regulate the draught: B, flue pipe passing through the outer base (C), and conducted out of the house at any convenient part; D, water space round the fire and flue pipe; E, return pipe for circulating the water; F, small funnel or small cistern for supplying the water.

The general dimensions are as follows:—Fire-box, twelve inches by sixteen inches; outside pipe, six inches diameter, inside flue pipe, three inches diameter, which leaves a space of one and a half inch for water.

The cost will vary according to size and length of house, &c. The sketch represents a twenty-feet house, with apparatus eighteen feet long. The cost of one of the dimensions given will be about £5, made of strong galvanized iron.

The advantages of this arrangement is the portability, with the economy of fuel and equal distribution of heat along the front of the house.

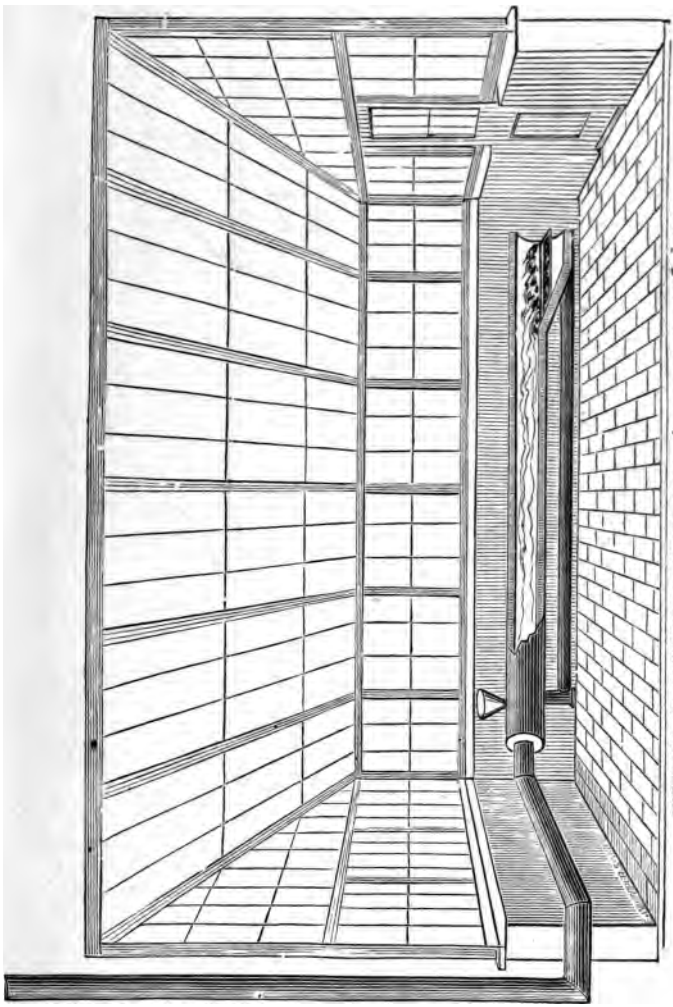
In a large or extensive range of houses the pipes can be carried in any direction, as any other hot-water applications, and two or more fireplaces can be attached with the fireplace outside the building, or inside with an air pipe from without to supply air to the fire if found injurious by taking it from the inside of the house.

The manufacturer is Mr. J. J. Carter, Peak Hill, Sydenham.

The Thermostat-Thermosiphon, introduced to public notice by our friend M. Sisley, of Lyons, may be considered as an ingenious modification of Riddell's slow combustion stove, and, like it, is simply placed where it is to stand, and requires no brick-setting. It is a peculiarly safe apparatus, the fuel and flames being on all sides in contact with iron, which cannot become excessively heated, because that is in contact with water. Hence, this apparatus is well adapted to place in an entrance-hall for heating the adjoining apartments, and perhaps a greenhouse or conservatory not far removed. M. Sisley, in describing it to us, says:

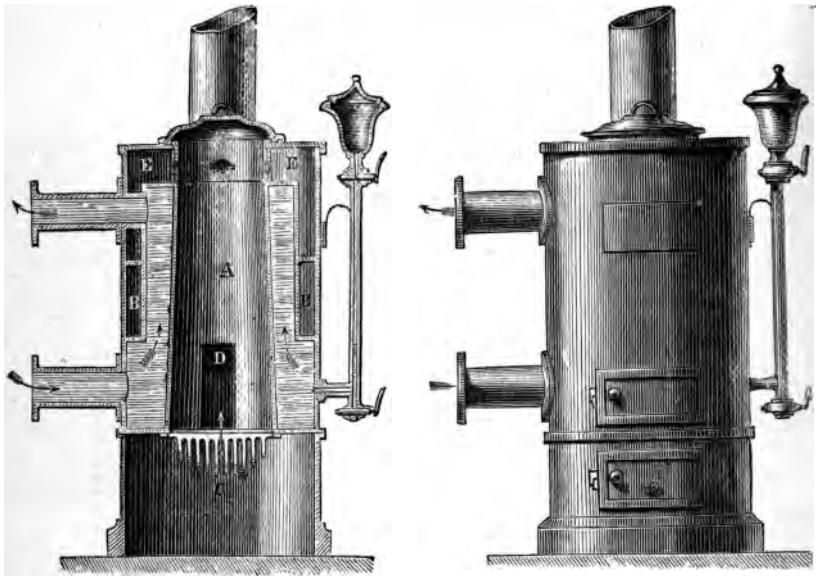
"By stirring it once in the morning and once at night, we could, by burning good coke, set light to the fire on the 1st of October, and keep it burning to the 1st of May, at an expenditure of from 16 to 24 kilogrammes of coke every twenty-four hours.

"The apparatus could be placed in the same locality—that is to say, in the plant house—destined to be heated, and its



INTERIOR OF GREENHOUSE WITH CARTER'S APPARATUS IN ACTION.

radiating heat rendered useful. But, according to our idea, a glass-house well constructed ought to be preceded by a lobby,



THERMOSTAT-THERMOSIPHON. (*Section.*) A. Firegrate. B. Vent-holes, through which the smoke passes to go out at D. C. The bars. D. Opening for allowing the escape of gas in combustion. E. Openings serving to excite the draft when the apparatus is lighted. E. The chimney.

(*Front Elevation*). At the foot, the ashpan; above the door of the fireplace; above, on the left, the two pipes for the circulation of the water, that above for the flow, that below for the return.

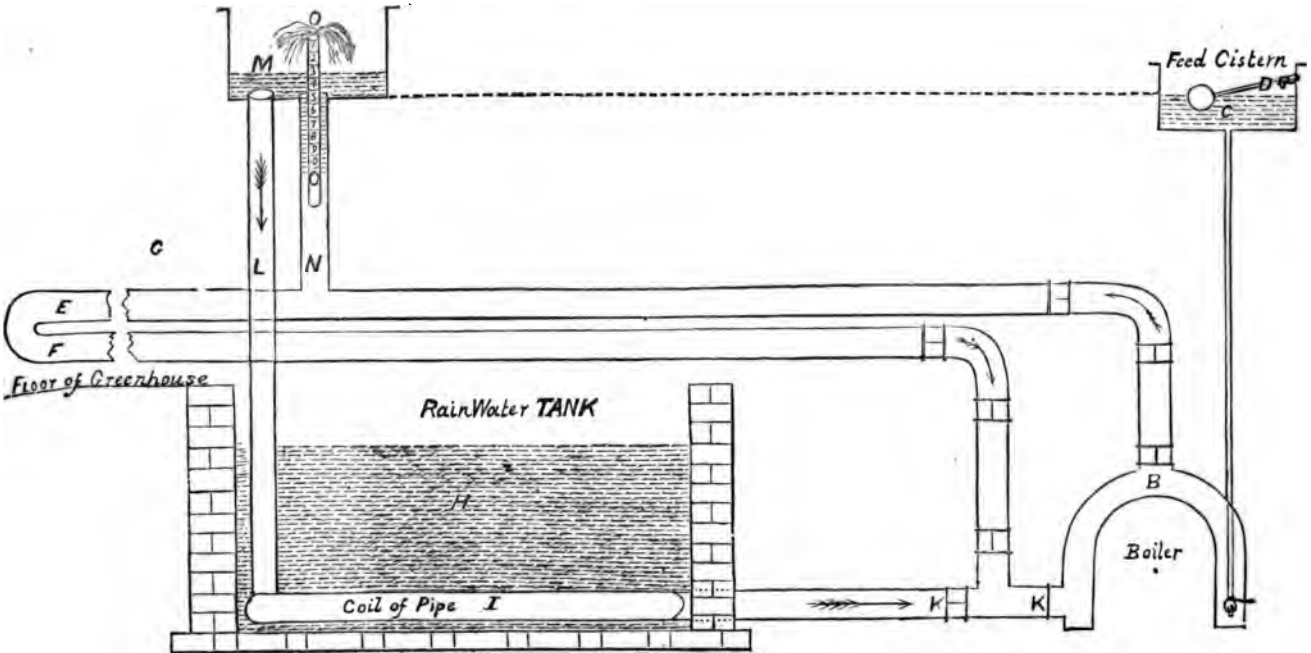
or workshop, which gardeners call a 'tambour;' we shall always advise to place the apparatus in the place which precedes the house, and content ourselves with the pipes for heating the house or houses, because the same apparatus is capable of heating several during the severe cold. The smallest apparatus could easily heat 100 mètres of pipes. Some dissatisfied minds object that this apparatus does not contain sufficient water about the fireplace, because, up to the present time, they have seen enormous boilers, and they think it is the size that gives power. Experiment has demonstrated that a huge quantity of water about the firegrate is useless, and that with a less volume of water a circulation is better kept up, because

the difference in temperature is greatest between the point of departure and the extremity of the pipes. What do we require, then, to obtain a good result? That the water in the pipes obtains as quickly as possible the temperature required, and preserves it for the longest possible time. The Thermostat-Thermosiphon realises these conditions."

Lastly, we are bound to mention Musgrave's Slow Combustion Stove, which is a stove simply, and not a boiler. It merits mention, because it is the only thing of its kind we would, without fear, place inside a plant house. It must be understood that we do not recommend either the introduction of a gas-flame or a fire of any kind into the same enclosure with any kind of plants, but it is our business to provide for a variety of circumstances, and it is with pleasure we are enabled to testify, from observation and experience, that Musgrave's stove is the least harmful amongst many contrivances recommended for placing inside a plant house, and at the same time easily managed, economical, and efficient, as a diffuser of heat. It is manufactured by Messrs. Musgrave Brothers, High Street, Belfast, and the prices range from 90s. upwards, according to size. For a house of one hundred to two or three hundred square feet of surface or more, this stove may be employed with safety, and in the case of a large house two or three stoves of small size would be more useful than a single large one. A 90s. stove will suffice for a house measuring twenty-five or thirty feet by eight or ten feet wide, but for any smaller sized house it is not suitable at all. The small upright charcoal stoves that are often used to protect miniature greenhouses are better than nothing if carefully managed, and that is all that can be safely said about them.

Mr. Rothney submits, for the amusement of those readers of this work who are inclined to speculations in engineering, the subjoined plan of a self-acting Thermostat. The description is as follows:

The expansive effects of heat on liquids is well known. Water when heated expands in the following ratio:—At 40° it is at its greatest density; at 65° it increases $\frac{1}{700}$ part; at 100°, $\frac{1}{139}$ part; at 140°, $\frac{1}{85}$ part; at 180°, $\frac{1}{32}$ part; at 212°, $\frac{1}{23}$ part. This being the case, we have a power which can be applied for regulating the temperature in hothouses, by causing the hot water in the pipes to remain at or not increase above a certain temperature desired, also at the same time storing up



ROTHNEY'S SELF-ACTING THERMOSTAT.

in a tank or otherwise any extra amount of heat which may be carelessly applied in the furnace.

Let B represent a common boiler, having a feed cistern (C); let E and F be the ordinary flow and return pipes for heating the greenhouse, under the floor of which is placed the rain-water tank (H). All this will be seen to consist of what is found in an ordinary greenhouse only. The rest can be added to any common house and heating apparatus, and consists of a layer or coil of pipes (I) in the bottom of the tank, and communicating with the return pipe and boiler at K; while from the other end of this coil is fixed the pipe (L) terminating in a cistern (M), the bottom of which is on the same level as that of the feed cistern (C). An upright pipe (N), with a sliding tube (O), marked with degrees, is attached to the flow-pipe (E), and also enters the aforementioned cistern (M). The tube (O) regulates the whole affair, according to its position; *e. g.* if this tube be raised one inch above the level of the water in the cistern and return-pipe (M) no circulation can take place through the coil unless the water be heated some 40°. If the orifice of the tube (L) be ten feet above the bottom of the boiler, and that of the tube (O) ten feet one inch, the circulation will commence only through the coil when the temperature of the water in the pipes exceeds 100° (the ordinary circulation will at all times proceed through the pipes in the greenhouse). If the temperature of the water be required to be 180°, the sliding tube would have to be raised about four inches above M; this is reckoning the water there to be about 40°; and it will be seen that these calculations are based on the table given at the beginning, and that no deduction is made for the water becoming slightly heated in the return-pipe (M); this being done for clearness. I find this is easily got over by the graduating of the tube (O) accordingly (the cistern (M) ought to be kept cold by a stream of air). The reader will see that no water can circulate only in the ordinary manner, unless the heat of the same exceed what is required; in that case it will, instead of flowing only through the pipes in the greenhouse, leave them and flow through the coil in the cold-water tank, and entering the boiler almost as cold as that in the tank, and continue to circulate through these until it becomes sufficiently cold to again flow through the pipes in the greenhouse.

In small greenhouses a very large fire may be made up

under the boiler at night without any danger, but rather the reverse, as any extra heat so applied will only heat the water in the cistern slightly, and which will be given off when the fire is gone out, thereby giving an equal temperature through this excess, while softening the water there and making it fit for watering purposes.

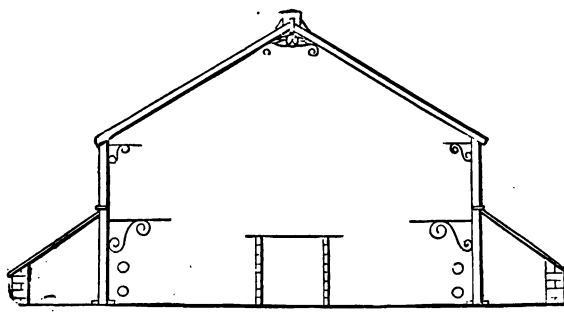


WIRE POT FOR FERNS AND LYCOPODIUMS.

CHAPTER III.

EXAMPLES OF PLANT HOUSE CONSTRUCTION AND HEATING.

A FEW examples of the various forms and arrangements of greenhouses may prove of more service to many readers of this book than the foregoing enumerations of elementary principles. We shall begin with a very servicable span-roofed house, adapted for a mixed collection of plants, with pits adjoining on each side for bedders and frame plants. It is designed with a view to secure the utmost economy consistent with efficiency. It will be observed that the pitch of the roof is low, the ridge being only nine feet from the ground line. The width is twelve feet. In arranging the plants the tallest specimens are

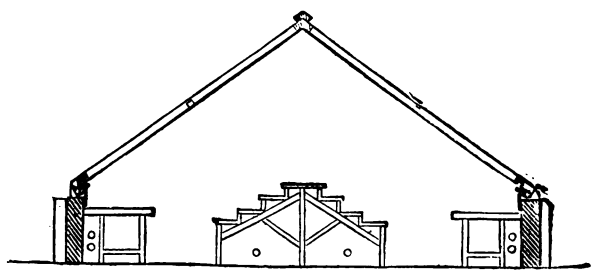


SPAN-ROOF HOUSE WITH PITS FOR BEDDING PLANTS.

placed upon the centre stage, the next size on the side tables, and the smallest stuff in the pits on each side. By this arrangement everything will have ample head room, and at the same time be near the glass; moreover, they will be placed under the conditions most favorable for a frequent examination. If preferred, the walk may be made down the centre, with broad flat stages on each side. The house should be

heated with a flow-and-return four-inch pipe on each side, and openings in each wall must be provided to allow the heat to escape into the pits to keep the inmates safe. There is no objection to the pits being heated with a separate system of pipes, from the same boiler, of course. Two-inch pipes will be large enough for the pits; and one passing down one pit and up the other will be quite sufficient for ordinary purposes, especially as the lights can be covered with mats in severe weather. The greenhouse floor should be laid with white and black tiles, unless stone can be procured at a cheap rate; but for the floor of the pits a bed of ashes will suffice. The openings in the wall should be provided with shutters, in case the frames should be occupied with hardy plants, that merely require protection from too much moisture; if side-lights are adopted, they should be made to slide, instead of pushing out, and, of course, be made to slide from the inside.

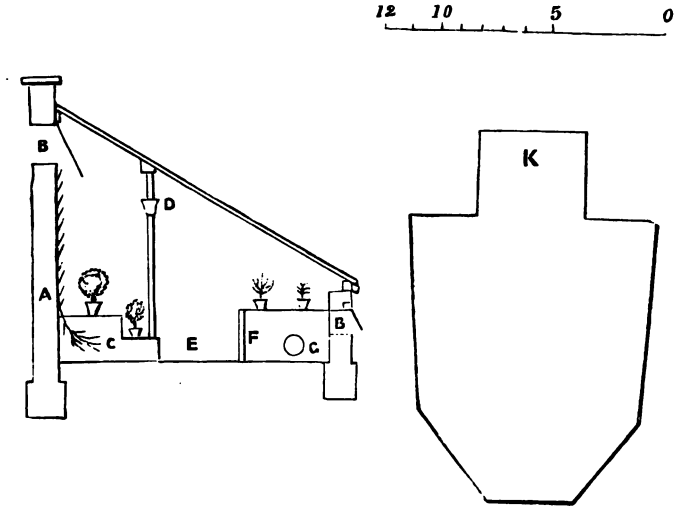
The next example is an improvement on the foregoing. The pits are removed, the space is wider, and the angle at ridge more sharp, and more ample staging is provided, the centre stage having the advantage of a course of pipes on each side, connected with the flow near the boiler. The width is seventeen feet, the height to the ridge nine feet. This would make a good vinery, and a number of plants could be grown beneath the vines, though, to be sure, some caution would be required in selecting them, and it would not be prudent to clothe the roof densely with the ample foliage of the vines.



SECTION OF SPAN-ROOF GREENHOUSE WITH STAGING AND HOT WATER PIPES.

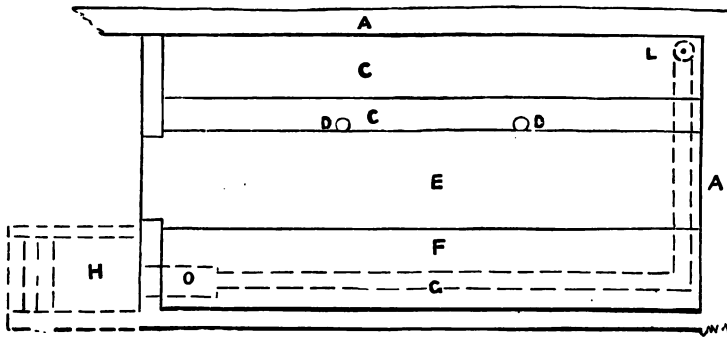
Now, we propose to go to work and build a cheap span-roof

house of a substantial nature, well adapted both for keeping a stock of bedding plants in winter and a fair supply of plants in flower all the year through. We must have a good wall to begin with, and reckon that as costing nothing in connection with the undertaking. We must next resolve to have a fixed roof, in order to use light rafters and secure ventilation at the back and front. One considerable item in the cost of glass-houses is the framing of sashes and the making them to slide open for airing. These not only consume a quantity of timber and increase the weight of the roof, which, in its turn, must be supported by large rafters, but they require the time and skill of a competent joiner to frame them. Now, so long as a roof is fixed firmly and steadily in its position, and without movable lights, large rafters may safely be dispensed with, and bars alone be used, as shown in the accompanying plans, the bars to vary in depth and thickness according to the width and



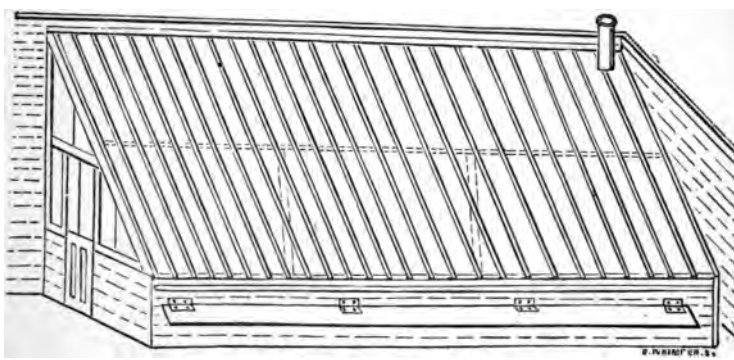
SECTION OF LEAN-TO GREENHOUSE SECTION OF SASH-BAR.

weight of the glass used. The section (K) shows a bar sufficiently stout for glass eight inches wide and sixteen ounces to



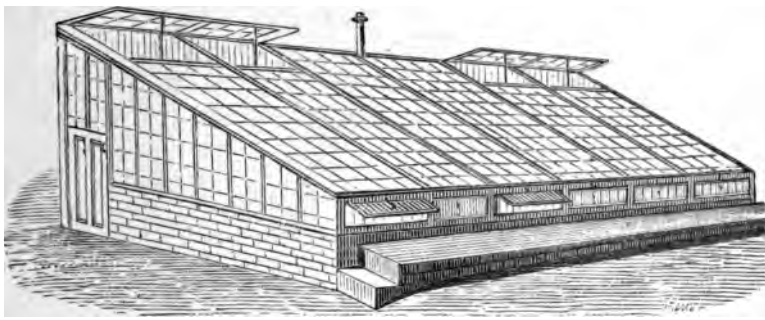
GROUND PLAN OF LEAN-TO GREENHOUSE.

the foot. These bars may be had ready grooved and planed at any of the steam saw and planing mills, and the purling, posts, wall-plate, boards to fix over the ventilators, &c., may also be bought ready for use, so that any ordinary carpenter or clever labourer may build such a house, and if a corner by the garden-wall can be spared it may be done for a small sum.



A, the back and end walls; B, openings in back and front *walls for* ventilation. Of these there should be plenty; a

board hung by common joints, to cover them when not required open, may have a string and pulley attached for lifting, and its own weight will keep it down. C, raised platform of earth covered with slates, bedded in mortar to set plants upon. D, posts or columns to support purling (I), on which brackets are fixed to lay a shelf upon. E, path. F, stage. G, nine-inch earthen pipes, fitting well into each other, and the joints well secured, inside and out, with mortar, leading from furnace (O) to chimney (L), for the purpose of keeping out frost. H, stoke-hole sunk three feet, and covered with wood covers. The scale applies to the ground plan, to show its measurements.



LEAN-TO WITH DOUBLE-BOARDED BACK WALL.

Another serviceable lean-to is represented in the two figures that follow. This was designed to fill up a space at the end of a garden where there stood for a back wall a thin boarded fence. To strengthen this another wall was built of old floor boards, "tongued" together with hoop-iron, and placed two inches distant from the original wall, with a few stout upright posts to keep all firm. The space between the two walls was filled in with sawdust, and the result was a wall of a most substantial character. A very low roof, with ventilators opening at top, was adapted with brickwork front and sides, and wooden ventilators the whole length of the front. As an excavation in clay was made for this house, a bank of the original clay was left in front, and on this mounds were made for melons in summer, and—the house facing due south—fine

crops were obtained. This, indeed, was one of the roughest and most useful houses we ever had, for many stove-plants throve in it, owing to its retention of sun-heat and its damp situation. In autumn a wooden trellis was laid over the bed



INTERIOR OF LEAN-TO HEATED BY MUSGRAVE'S SLOW COMBUSTION STOVE.

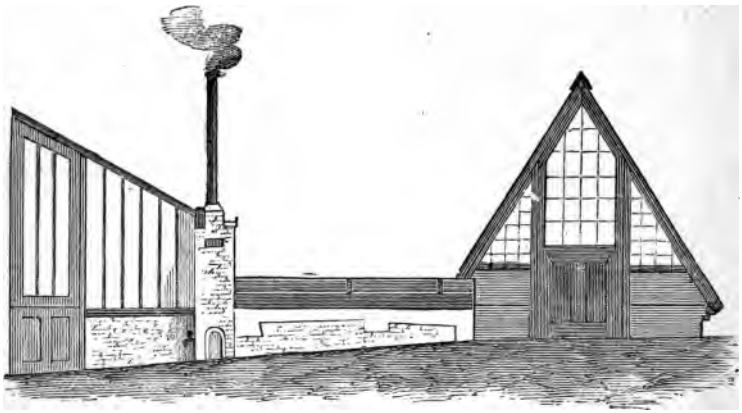
in front, and on this bedding plants were closely packed, and generally got through the winter well with the aid of a Musgrave's stove that cost £6, and was fitted with a flue consisting of four-inch glazed drain-pipes. The bare space on the back wall, seen in the view of the interior, was occupied during winter with tall geraniums, that were kept for making pyramids in the flower-garden during the summer. The reason for the adoption of the Musgrave stove was, that it was impossible to obtain sufficient depth to make a proper stoke-hole for a furnace, owing to the water in the soil, and the reason the house was built at so low a level was, that it should not be seen above the line of the fence, as that would have spoiled a pretty view. Thus it is that extreme cases occur, and have to be met as best they may.

A nearly similar case occurred with a couple of houses which were so near the winter water level that it was a difficult

matter to go deep enough for the furnace. This case affords an example of heating on the level, and must be described with some detail. The houses to be heated are a lean-to and a Paxtonian; they are so nearly on a level that a quick circulation is not to be hoped for, and the lean-to has beside it a well, which frequently overflows in the winter season. Between the highest point the water reaches and the flow-pipe in the lower house the perpendicular difference is thirty inches, and between the bottom of the boiler and the level of the water the difference is only fifteen inches.

If you want the quickest possible circulation of hot water, fit a perpendicular syphon through a saucepan lid, seal the lid down waterproof and fireproof, insert a small tube at the top of the syphon, and through that tube fill the whole concern with water, and then put the saucepan on the fire. The circulation will begin instanter, and will be perfect from the first moment that accessions of heat are communicated from the fire to the water. The laws which regulate the movements of heated fluids are fully explained and illustrated in the books that treat of physics and natural philosophy, so it is not worth while to go into that part of that subject here. It only concerns us to know that in a perpendicular column of water the movements caused by heat are most decisive and complete, and that every deviation from the perpendicular tends to arrest the motion, so that when we reach the horizontal, the rate of motion is reduced to a minimum, or may absolutely cease altogether, which in a certain sense is less than a minimum, as nothing is less than the least. In the heating of these two houses we had to calculate to a great nicety how to make the most of the perpendicular space at command—to consider, in fact, how much could be done between the *lowest* point at which the pipes could be placed in the houses, and the *highest* level of the water in the well. The lower house was the only difficulty; the other was so far above it that if we ever got a fire to burn, and water to get hot thereby, on a level sufficiently low to heat the lower house, the Paxtonian would be safe enough.

Now, it is worthy of observation that the plan adopted in this case was not the only one at our command. We might have taken round the houses a *flow-pipe of very small bore and a return-pipe of very large bore*, and by this means have secured a circulation, and derived our heat from the return-

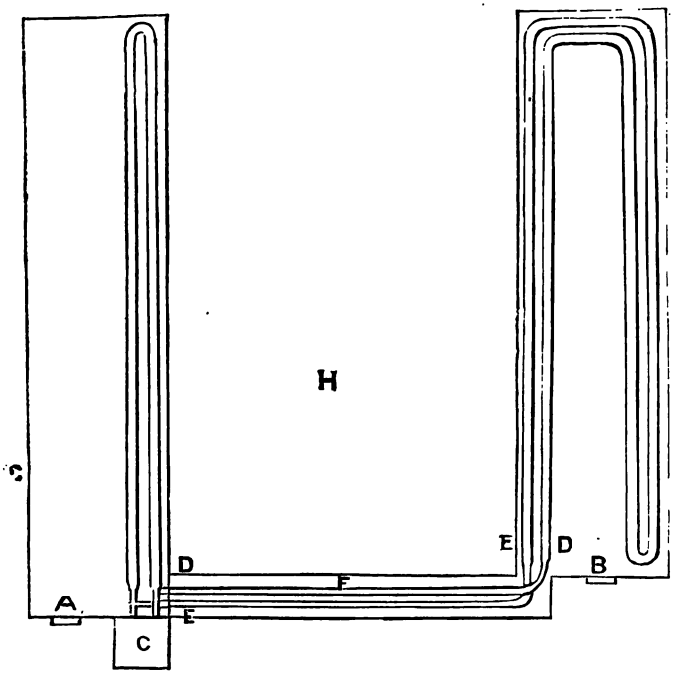


EXAMPLE OF HEATING ON THE LEVEL.

pipe chiefly. We preferred to heat the houses in the orthodox fashion, and selected for the purpose one of the upright conical boilers of the Thames Bank Company, and left Mr. Dunbar to fight it out, and the result of his operations was that the lower house was heated with four-inch flow-and-return placed side by side in the front of the house, on a dead level, and from these heat enough was derived to keep all safe in severe frosty weather.

The figure will show that the Paxtonian stands slightly above the level of the lean-to; so we had but to make sure of a fire in the furnace, and the heating of this house was an easy matter. The pipes had, however, to be taken a distance of twenty-five feet from the furnace to the Paxtonian; and, as this would cause a great waste of heat, a long, trough-like wooden box was fitted to the dwarf wall on which the pipes rested, and they were thus enclosed from the weather. The box was covered with stout shutters clothed with felt, and it became immediately a dark forcing-pit, and has been used ever since, during the winter and early spring, for forcing sea-kale, asparagus, rhubarb, &c. The pipes in this box are of two inches bore, to cause a quick flow, and make the waste of heat the least possible; but, as soon as they enter the house, they are *enlarged to four inches*, and thus they pass all round the house,

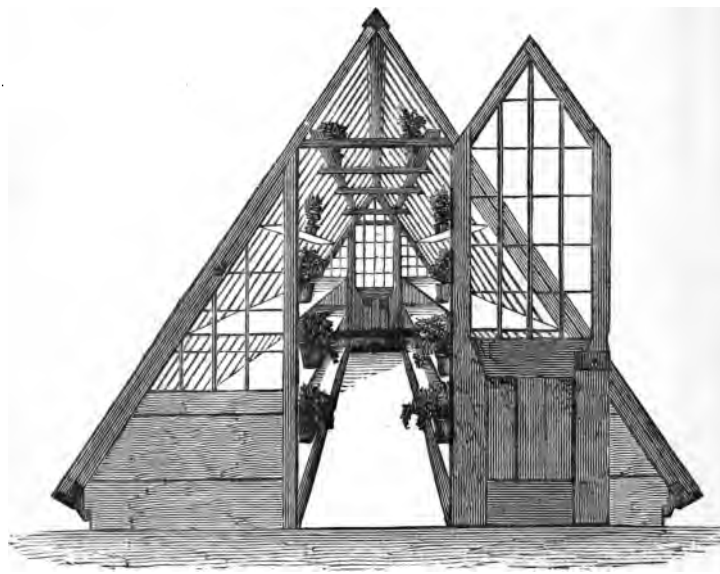
close under the glass, and resting on the borders. The arrangement may be understood from the subjoined diagram.



ARRANGEMENT OF PIPES IN EXAMPLE OF HEATING ON THE LEVEL.
A. Entrance to lean-to. B. Entrance to Paxtonian. C. Boiler.
D. Flow. E. E. Return. F. Forcing-pit.

The solution of a difficulty in this simple way is a matter of more than passing interest, for where it appeared impossible to employ a hot-water system it has been effectually accomplished, and a most excellent forcing-pit obtained into the bargain. It is an important exemplification of established principles that the lean-to which adjoins the boiler, and receives its pipes directly from it, obtains far less heat than the Paxtonian, which is twenty-five feet distant, and the pipes which

supply it first have to heat a large body of air and material in the forcing-pit. The lean-to is never more than a decidedly cool greenhouse, but the Paxtonian may be heated to the pitch of a stove by simply driving the fire a little. The difference is due entirely to the fact, that from the boiler to the Paxtonian *the pipes rise*, whereas in the other house they are on a dead level throughout. This very fact proves that our difficulty in the first instance was not imaginary, and renders its solution the more satisfactory.



PAXTONIAN PLANT-HOUSE.

By this time some prudent reader will be asking if the question of "tenant right" in plant-houses is likely to engage our attention? Well, that is the very question we intend to illustrate in the next examples. The prudent reader need not, of course, be informed that, according to the law of the land, plant-houses, from the moment of their fixture in the soil, become the property of the freeholder. But it may be less generally known that the best house ever built is scarcely

worth the trouble of removal after a few years have elapsed,

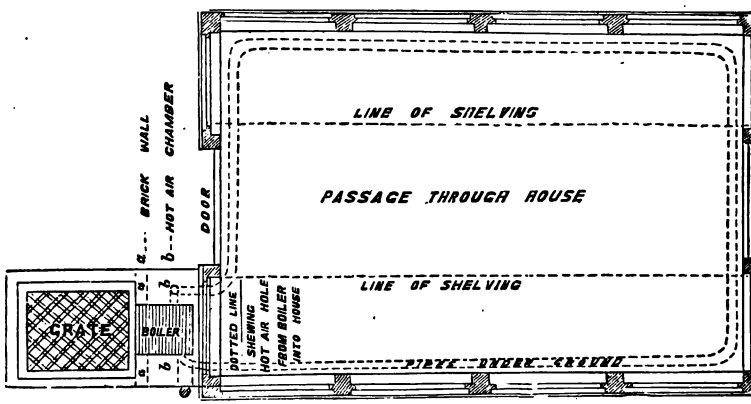


PORTABLE GREENHOUSE.

unless it was intended from the first to be removable at the will of the owner.

There are several kinds of portable houses now provided by enterprising manufacturers, and amongst many good ones that known as the "Paxtonian," the invention of Sir Joseph Paxton, is, perhaps, the best. Leaving the reader to select for himself the ready-made article, we proceed to show how portable houses may be constructed by village carpenters and handy amateurs.

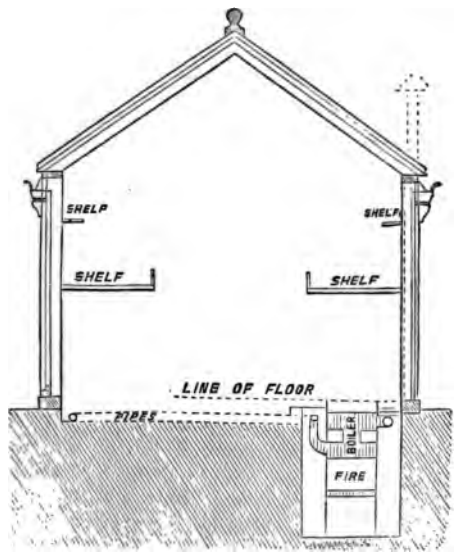
The house represented pp. 45, 46, 47 was built by Messrs. Walker & Co., Newcastle-on-Tyne, for our correspondent, Mr. Lant, of Cottonstone, Barnard Castle. The ground plan and section will explain the whole construction. The house is twelve feet long and eight feet wide; the side lights five feet high from



GROUND PLAN OF PORTABLE GREENHOUSE.

the base; the roof ridge eight feet from the floor. There is an open space of two inches width for ventilation along the top line of the side lights, concealed by the zinc spouting, and another similar space along the ridge. Both these can be opened and closed at pleasure. The door panels and glass over door are on hinges, so as also to serve for ventilation. The interior is fitted with shelves two and a half feet wide. The house is heated from a boiler, which only holds a gallon of water, placed a foot deep below the surface of the soil. The hot-water pipes are two inches in diameter. The flue is a

four-inch galvanized iron pipe; the fuel used is coke broken small. The cost of the house and its fittings was £25. Mr. Lant says that he has tested its portability, for he once removed it on a railway truck a distance of sixty miles. "We put three spokes under the base of the house on each side, six spokes in all, and two men at each spoke carried it to the railway truck, and thence to its new site, in perfect safety and without drawing a nail. The house and twelve dozen plants were carried in perfect safety a distance of sixty miles on the North-Eastern Railway for 25s."

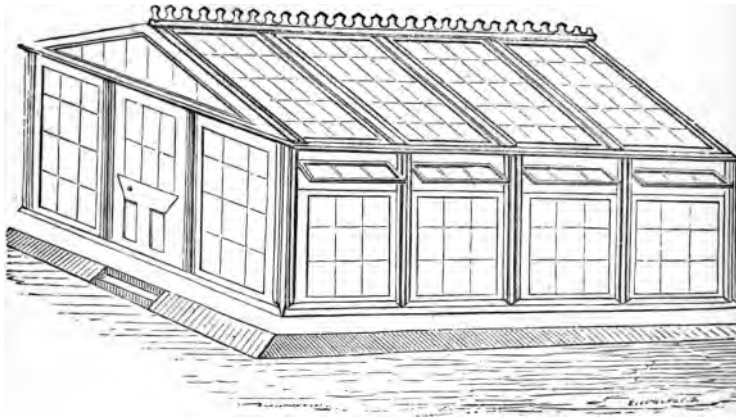


SECTION OF PORTABLE GREENHOUSE.

The last example will be an improvement on the foregoing, with every particular of construction from first to last. The details of construction are represented pp. 48, 49, 50, and 52.

The diagram of the elevation shows a detached building set upon a raised platform of earth, to give it a greater apparent elevation, with a gravel walk surrounding it, and two steps placed in the grass slope, by which to ascend the platform. The house is composed of parts that, when taken to pieces, may

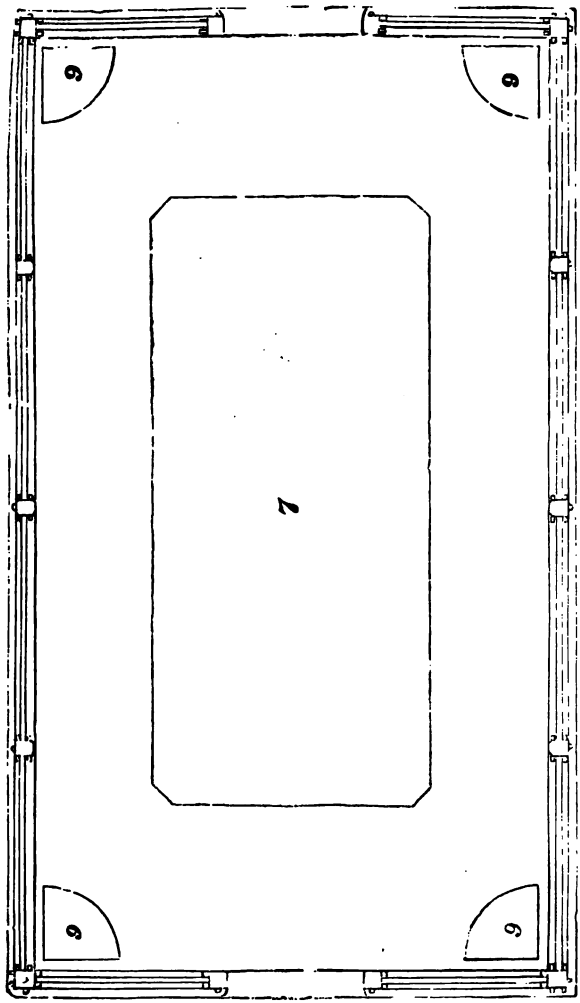
be easily packed up conveniently for carriage. They consist, first, of the ground sill, which may be of teak, if the expense is not an object.. seven inches wide, by four inches in thick-



REMOVEABLE GREENHOUSE.

ness, the four sides of which are held together at the angles by means of irons screwed on with square-headed screws (Fig. 9 *a*). No pegs or nails are to be driven into any of the mortise tenons, but in every part use, in lieu thereof, either the screws Fig. 9 *a* or Fig. 9 *b*. The studs are mortised into the sill, and have a substance of four and a half inches by four inches; and these again are mortised into the rafter-plate (see section, Fig. 11). Between these studs (see section, Fig. 10) the sashes (*b*) are set up, and to keep them steadily in their places splines (*e*) are braded on to the studs. These sashes may be exactly like those used in house building, without, of course, the accompaniment of boxes and weights. Upon the front of the stud a half-circular moulding (*c*) may be braded to give a degree of lightness to the appearance. Also to the same end, as well as to throw off water, let the sill be bevelled at *d*. Above the sashes are to be hung on pivots small lights for ventilation. These may be opened and kept so by means of a small iron having holes in it, to drop on to a pin fixed in the lower sash (Figs. 11—5). This iron must also have a joint so as to hang down when the ventilator is shut. The

rafter-plate and gutter are formed out of one piece, seven inches



GROUND PLAN OF REMOVABLE GREENHOUSE.

4

by four inches, and the gutter must be lined with zinc or thin lead, to prevent the water injuring the wood. A small lead pipe will convey the water down the inside angle of the building into a drain or tank; the rafters are five inches by three and a half inches, and have a beading braded on to their under side, and a capping on the top, for the double purpose of keeping the roof lights in their place and the water from getting into the house; but, in addition to the capping, the lights

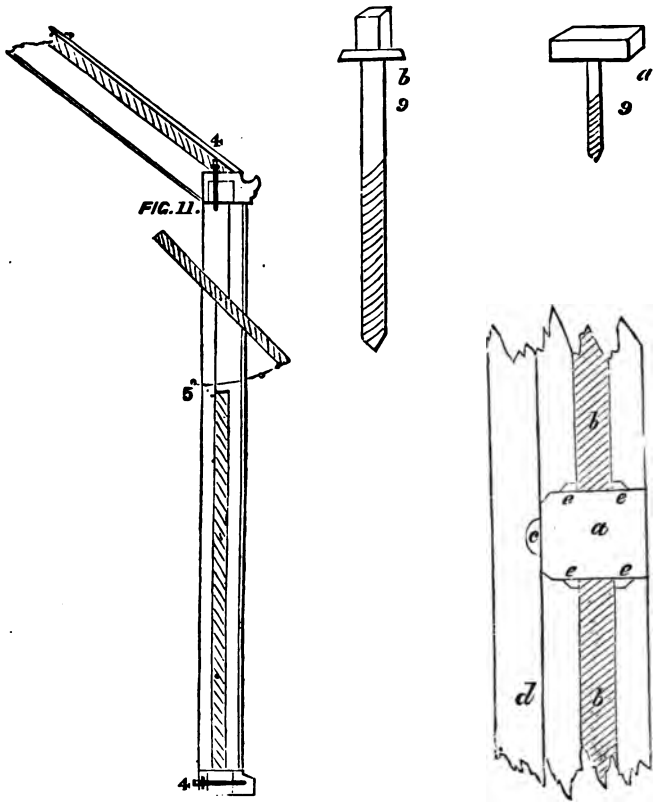
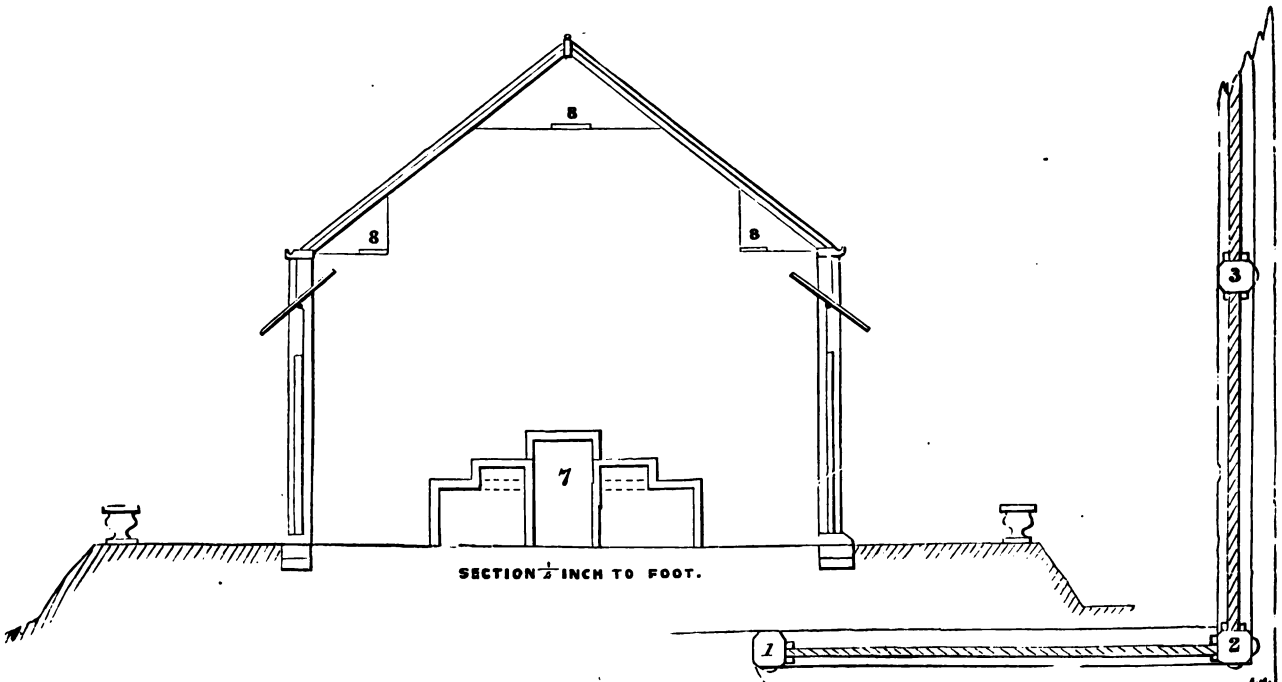


FIG. 11.

must have screws (Fig. 9 *b*), commonly known as bed-screws,

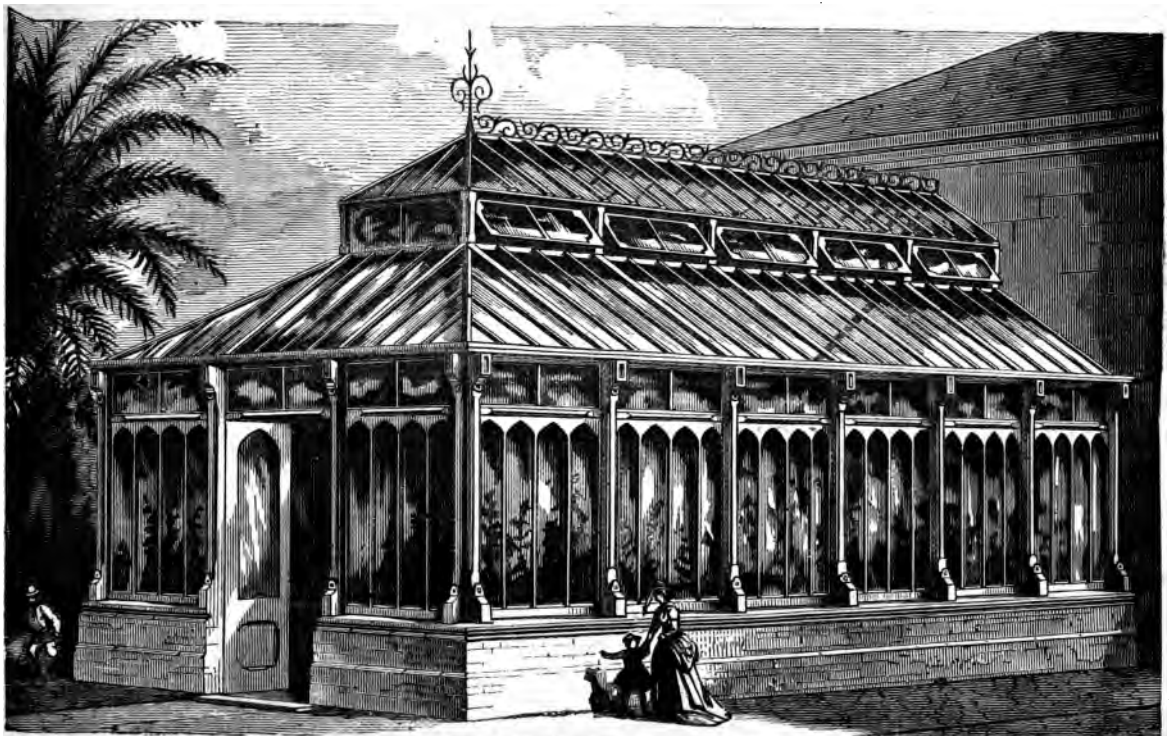
put through the top and bottom into the ridge-tree and rafter-plate. The rafters and studs must likewise be secured by these screws, as at Figs. 11—4. In the section, Figs. 1, 2, and 3, show the door stud, the angle stud, and one of the side studs, which are all of one size, the difference consisting only in the putting on of splines and mouldings. The end gable lights may be fixed in their places by means of splines, in the same manner as the side sashes. In the same section, Fig. 8 represents light iron rods suspended from the rafters, as bearers of light shelves, for the accommodation of bedding plants, or other small things which require a situation near the glass. Referring to the ground plan (9, 9, 9, 9) are boxes placed in the angles, in which may be planted climbers, to train over the roof or sides of the building. Fig. 7, stage, which must be strong enough to bear the plants, but may be made in parts, so that it can be removed without having to be knocked to pieces. It will be necessary, in order to protect the building from damp and the liability to settle down, to place it upon some firm and solid matter let into the ground, as brick piers or wood blocks. A platform of bricks laid on the surface, gives a firm and lasting foundation, provided the subsoil has not been recently disturbed.

The heating of a moveable house must also be managed by a moveable apparatus, which will be some kind of stove, and which must have a pan on the top to hold water; and as artificial heat in such a house as this will only be required in winter, the stove might, for that period, occupy a place near one of the doors, and the smoke-tube be carried through the glass at the top of the house. Should a building of this kind be required for vines, the side lights should be reduced to one half the height, and these to open, as here shown, for ventilation; the roof lights would then be longer, and a much steeper roof obtained. A small aperture or two at the ridge, capable of being closed by a wood slide, would, with the side lights hung as recommended, effect a perfect ventilation. The walk would, in such a house, be down the centre, and the vines might be planted in boxes, having large openings in their bottoms to allow the roots to escape into a border made up inside the house for that purpose. The planting them in boxes would enable them to bear removal at almost any season.



SECTION VIEW OF REMOVABLE GREENHOUSE.

Between the conservatory and the greenhouse there is about the same difference as between a dinner and a luncheon. It is impossible to draw a hard-and-fast line between them, and yet they differ in plan and purpose very decidedly, The greenhouse is intended principally for production, and is more or less of a storehouse. The conservatory is intended for enjoyment and display. Some very humble and, in some cases, useless glass structures are styled "conservatories," but the term applies properly to an edifice of sufficient size to accommodate camellias and orange trees, and the free movement of full-grown persons attired in a manner which would render it inconvenient for them to come in contact with damp flower-pots. A conservatory should be more or less of a garden under glass, and adapted for frequent resort and agreeable assemblage at all seasons, and especially at times of festivity. Hence, in designing a structure of this class, we must not adhere strictly to the advice given in the first chapter of this work, but endeavour to combine elegance, head room, and airiness, with conditions suitable for plant life. It must be confessed that the low roofs, which suit the majority of plants so well, are undignified, and therefore we must abandon that rule in the case of a conservatory. But in doing so, it will be well to bear in mind that not one of our plants will alter its nature to suit our fancies and fashions, and therefore there must be a limit to every extension of the primitive idea of a plant-house, for above all things we are bound to secure for the vegetation the house is to shelter conditions favorable to its prosperity. Now, the apparent difficulty may be disposed of by remembering that abundance of light and a constantly moving atmosphere are the two chief requisites to be provided for in the construction of a plant-house, no matter whether we call it a stove, a greenhouse, or a conservatory. Darkness, stagnant air, and keen draughts, are the principal enemies of plants that are shut up in houses, and it is compatible with the highest elegance of design, and the most artistic finish of detail, to ensure the best possible protection for them against these destructive agencies. As we must have aerial as well as lateral space in a conservatory, so, to make the contents worthy of the edifice, we must employ plants of large growth, and a certain number of them should aspire towards the roof, to carry the eye upward and fill the space above that would, if unoccupied, make an unpleasant impression, however richly



CONSERVATORY BY BOULTON AND CO., NORWICH.



CONSERVATORY PLANT-STAGE BY BOULTON AND CO., NORWICH.

the stages and tables might be furnished. Happily, we are rich in noble plants adapted for the purpose, and that require for their preservation a winter temperature which exactly suits the human constitution, so that, by prudent selection and good management, a conservatory may be made a place of agreeable resort at every season of the year, and be especially pleasant to afford a change of scene and occupation in the winter season. It is, however, painfully common to meet with grand conservatories that are utterly unfit for their intended purpose, the work of architects and builders who were so unfortunate as to know nothing of plant growing. When we are approaching a conservatory with a bold frontage of stone pilasters and heavy cornice and recessed windows, in the style of a Grecian temple, we are fully advertised of the appearance the plants will present when we gain access to the interior. The conservatories that architects unskilled in horticulture provide for their employers usually have this distinguishing character, that no plant will thrive in them, and very few will live in them; therefore, as conservatories are costly things, it will be well for those who intend to pay for them, to take measures, in good time, to secure suitable designs, and employ competent persons to carry them into effect.



CHAPTER IV.

THE AMATEUR AT WORK.

THIS chapter is intended to prepare the amateur plant-grower for the routine of greenhouse work. It will not provide for every contingency, but it is hoped it will prove of service to the beginner, and be otherwise than wearisome to readers who have made some progress in the practice of horticulture.

It is to be observed at the outset that the cultivation of plants in pots is the chief business before us now, and that is, in many respects, a different matter to the culture of the same plants in the open ground. A plant in a pot is like a bird in a cage, wholly dependent on the hand that feeds it and therefore in need of constant watching. A plant in the open ground is like a bird on a tree, for, although it cannot fly to find food and drink, it can send its roots far and wide to search for what suits it, and many plants have the power to shift their ground, so that if the rich border does not suit them, they may, perhaps, try the gravel walk, and, if allowed, make a vigorous growth amongst the flinty pebbles. To grow a plant in a pot must be the aim of every amateur who possesses a greenhouse, and the task is not a small one. For the illustration of the subject let us take two extreme cases. The first shall be that of the unskilled beginner, who provides a large pot for a small plant, and some stuff which we must call mud for the roots of the poor thing to *perish in*. You will find examples of this case if you look for them, especially amongst beginners in window gardening. You will find that plants potted in black mud are kept soaking with excess of water for weeks together, until they are nearly dead, and then are allowed to go dust dry, and end their miseries ignobly. The other extreme is that afforded by the man who grows plants for the market. He provides for the public very large plants,

wonderfully rich in leaf and flower, in pots so small that, like the king who was puzzled by the apple dumpling, one might wonder how the roots were ever got into so tiny a receptacle. The amateur may take lessons from both, but he is not to follow either, for the market system of plant growing is not adapted in all particulars for the private garden. But if you will purchase one of these luxurious plants, you will find that it is in a new pot, and that the soil is sandy, and will not acquire the texture of mud or paste, even when heavily watered. If you turn the plant out of the pot, you will find that the roots form a tough fibrous mass that have touched the pot all round, and, at the bottom, are closely wound round some pieces of broken brick or flower pot that, in the first instance, were carefully packed so as to afford instant escape to every drop of water in excess of what the soil in the pot would retain without being actually wet. The leafy part of a plant must have light and air, and the roots must have air and moisture. The plant that was potted in mud was killed by suffocation, for the texture of the soil prevented the access of air to the roots. The beautiful market plant was nourished by air as well as water at the roots, and it was encouraged to make a free growth before coming into flower, which, in the first place, ensured size; and then it was allowed to get pot-bound, which promoted the production of an abundance of flowers; and to make amends for the comparatively small amount of soil in the pot, it was supplied from the first and always with soft water slightly charged with some fertilizing agent, and always warm as the air the plant was growing in. There were other circumstances that conduced to its perfection, but these we will not inquire into, because, as remarked above, the amateur cultivator would not be prudent in adopting the practice of the market growers *in extenso*, even if that were possible, as, generally speaking, it is not.

It is, therefore, important to master the art of growing plants in pots, and for the practice of this art a certain amount of machinery is necessary, which we shall now hastily describe.

THE POTTING SHED is the workshop, storehouse, and tool repository. It is a good plan to place it so as to cover the stoke-hole, and thus make a snug place of it in winter. It may be a quite rough affair, but it must be large enough and weather-proof, and quite light. Old window-frames and doors may be

used up advantageously in making a potting shed, and a brick or tile flooring is to be desired. A lean-to with tiled roof, in which a few glass tiles are inserted, will answer well, if a wall can be spared for it, and the whole front may be open, if the situation is quite sheltered. If the front is closed there must be two or three windows. To give an idea of the proper size for such a shed we should say that a length of twelve feet and a width of eight feet would suffice for a small garden. Any way there must be room for handling plants and for a wheelbarrow to turn, and for a store of necessary materials.

A strong bench should run the whole length of the shed, and beneath it should be rough bins with sloping fronts for storing loam, peat, sand, and other stuff. The stout uprights which support the bench will afford a holding for the divisions of the bins, which should be six in number at least; one or two of them much larger than all the rest for loam and peat, of which there must always be a good store. The sloping front should drop into grooves to facilitate filling the bins. A locker for labels, seeds, and other oddments will be useful, and the whole of the garden tools may be accommodated on the back wall by providing rails and hooks to hang them on.

Composts for plant-growing are compounded in a great many different ways, as patent medicines are; but the wise cultivator will not have many of them. We will suppose that the bins are filled with materials. These should consist of mellow loam full of decayed fibre, tough fibrous peat, silver sand, leaf mould, potsherds, old broken plaster or mortar, and the most rotten portion of the manure from an old hotbed or any similar source. With these before us we will prepare what shall henceforth be termed the *universal compost*. We will put upon the bench a bushel of the loam, a peck of leaf mould, a peck of the powdery manure, and half a peck of silver sand, and proceed to chop them over and mix them with the trowel, throwing out all large stones as the mixing proceeds. If this is well done the compost will be ready, and will suit perfectly nine tenths of all the plants you are likely to cultivate. Another useful compost will consist of one bushel of peat, one peck of leaf mould, and one peck of silver sand. This will suit for the remaining tenth; and upon my word, if you never deviate from these prescriptions, you may become, by proper attention to other

matters, an expert plant-grower and a winner of first prizes. Sometimes loam and peat are mixed, and we must confess that we ourselves mix them; but the mixing can scarcely be considered good practice, for one being decidedly acid and the other decidedly alkaline, they do not quite agree when chopped up together. As a matter of fact, however, it must be confessed that the best plant-growers employ both loam and peat in composts, and see no reason to doubt the propriety of the procedure.

It will be found in practice that young plants of all kinds and plants of soft texture, whether young or old, thrive best in a light soil containing a rather large proportion of sand, whereas plants that are advanced beyond the stage of infancy, and all plants of woody texture, of whatever age, require a firmer compost. Hence, in potting a lot of little things, that have just begun to put forth roots, sand and leaf mould may be added to the compost; or in shifting on robust habited plants that have acquired a place in the world, it may be well to add loam or peat, as the case may be, just as in feeding a baby soft food is alone suitable, whereas a "lubberly boy" will want cartloads of bread and meat and pudding.

It is a bad practice as a rule to sift composts, for they should always be rather lumpy, and the finest part should be reserved for filling in at the top of the pot. But sifting may be proper in preparing a mixture for seedlings and cuttings, and the finer the compost the larger should be the proportion of sand in it, to prevent its becoming an obnoxious paste. There ought not to be a single worm in any mixture for pot plants. Large stones must, of course, be removed. Any bits of decayed wood which occur in the leaf mould should be thrown out. A mixture ready for use should be quite damp, yet dry enough to be handled freely without soiling the fingers. If it is wet and sticky it is not fit for use.

A capital basis for the universal compost may be prepared in the following manner:—Procure equal quantities of the top spit of a good loamy pasture and of good stable manure from well-fed horses. As they are carted into the yard have them built up into a tall square stack in alternate layers, a layer of turf, and a layer of manure, and leave the stack untouched for twelve months. Then cut from the stack by slicing downwards from the top as wanted, and take the mixture as the basis of a loam compost, adding sand and leaf mould to lighten

it, but not adding any manure, as in this respect it will be rich enough already.

Loams and peats differ so much in quality that it is difficult to convey an idea of what is good or bad of either. Nevertheless, it will not be difficult, in any district, to make discovery of the best sorts available for horticultural purposes, and the amateur who means it will soon discover the way.

Having always dwelt in a northern suburb of London, we have been accustomed to keep a good store of Wanstead peat in the garden for all rough purposes, and have trusted to Epps's "selected" peat, which is packed in barrels and sold at a reasonable price by Mr. Epps, of Lewisham, for all the more delicate habited of the peat plants. As for the loam, that which we are best accustomed with is a modified clay, except when full of fibre; we use none but silver sand from Reigate for small work, but find the siftings of the sweepings of the gravel walks the best of sand in the world for general use. Leaf mould must be prepared at home, and the way to ensure plenty is to lay up grass mowings, leaves, and the worn-out stuff from flower-pots in which plants have been grown in a compact heap *above* the level (not in a pit or any wet place), and allow it at least twelve months to rot through; it is better if allowed to remain two years.

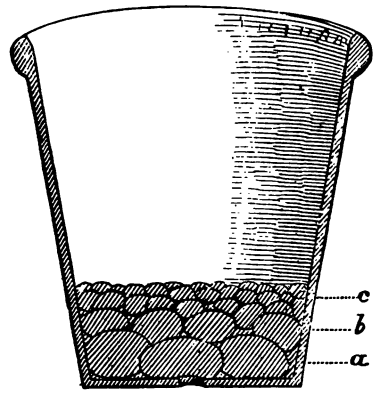
POTTING is a test of dexterity, even amongst experienced gardeners, for many who could pot off "bedding-stuff" by the thousand in "no time" would have to put on a "puzzling cap" if required to repot a gigantic agave or camellia; but on good potting success will turn more certainly than on any other separate process in all the round of greenhouse practice. We will first speak of the pots, which must always be clean and better if new. The sizes required for ordinary purposes are 60's, which are three and a half inches in diameter at top; 48's, which are five inches in diameter; 32's, which are six inches in diameter; and 24's, which are eight inches in diameter. To clean old pots is a simple matter enough; but it may be well to remember that, if a lot of old pots are left lying loose about out of doors all the winter, they will be quite clean and as good as new in spring, for the frost will scrub them, not only on the surface, but in the very pores of the clay.

In preparing the pots, first of all place in the bottom,

hollow side downward, a concave piece of crock large enough to cover the hole. Over this place a layer of crocks, the thickness of which must be regulated by the size of pot and the character of the plant. We will take a six-inch pot or "thirty-two." If a soft-wooded plant, such as a geranium or fuchsia, is to be potted, it will suffice to place five or six rather large crocks over the one which covers the hole. On the other hand, in preparing the pot for a hard-wooded plant—such, for example, as the heath, the crocks should be broken up small and placed in the pot somewhat regularly to a depth of about an inch. For large pots it will not be necessary to break the crocks so fine, but in no case must they be used too large. Over the crocks put a layer of the rougher portions of the compost, flaky leaf mould or dried moss, to prevent the finer portions of the compost running down between the crocks and choking up the drainage. If precaution is not taken to prevent this mishap the superfluous water will be unable to escape, and the soil will soon become sour through remaining in a saturated condition.

To form a nice bed for the ball of the plant to be potted put in the bottom a sufficient quantity of the compost to raise the plant to the desired height. No rules on this point can be given, but in no case should the crown of the plant be buried very deep, and in the case of large specimens of hard-wooded plants sufficient soil should be placed underneath to raise the surface of the old ball of soil high enough to require little or no soil over it. In all cases the soil must be pressed firm, and composts consisting entirely or chiefly of peat will require much more pressing than would be desirable for composts of which loam is the staple. In potting off from cutting pots there will be no difficulty in pressing the soil firm enough with the hands, but in shifting established plants from one pot to another a potting stick will be necessary. This can be readily made, and the most convenient size will be fifteen inches long, an inch and a half wide, and between a quarter and half an inch thick at the top, to admit of its being more readily grasped with the hand; the corners can be shaved off with the knife. With this the soil must be worked regularly round the ball, so that no vacant space may be left between the old ball and the side of the pot. The soil must also be pressed to an equal degree of firmness all round the ball; for if less firm on one side than the other the water

will drain away down that side, and the other side will be only partly moistened. In repotting plants growing in peat it is well-nigh impossible to ram it too firm, and unless the new soil is made quite hard the water will run through it before the old ball has become properly moistened. It is owing to a neglect of this precaution that so many cultivators fail in growing hard-wooded plants satisfactorily. It is not less important for the old ball of soil to be of a proper degree of moisture for the well-being of the plant before it is transferred to a fresh pot, for when the soil is in a dry state there is a considerable amount of difficulty in moistening it afterwards. In the event of a difficulty in making the soil equally moist, whether in the case of a plant that has been long in the same pot, or one newly potted, make an end of the difficulty, by



FLOWER-POT READY FOR USE.

a, *b*, *c* are three layers of crocks or potsherds, the largest at the bottom, the smallest at the top.

dropping it gently into a bucket of water, and leaving it there for half an hour, by which time the roots will be well wetted throughout.

PROPAGATING by seeds and cuttings will be part of the

regular routine work, and the amateur who loves plant growing will be ambitious of distinction in this part of the business. It must be confessed, however, that to take a young plant from the hands of a nurseryman, and by careful management develope its full capabilities so that in due time—it may be but a few months or it may be many years—that plant shall have become a noble specimen, is a task far more worthy of an amateur's ambition. We can always buy plants to begin with, but we must acquire by patience and perseverance the skill requisite to the development of their beauties. One of the first requisites to success in the multiplication of plants is a propagating house or pit. It is customary to enclose, by means of a glass screen, a small portion of the warmest end of a stove or greenhouse for this purpose, and to ensure bottom-heat by means of a shallow tank covered with slates, the water in the tanks being heated by conducting through it the flow-pipe at the point where the latter is connected with the boiler. But almost any amount of propagating may be done without any special arrangement of this sort, especially in a garden where a hotbed is made up in spring, and advantage is taken of the natural heat of the earth in the later portion of the summer season. Frames and pits are valuable auxiliaries to the greenhouse, and, indeed, there can be but little done without them where soft-wooded plants, notable for an abundant production of flowers, are held in favour. The grower of hard-wooded plants and succulents will have much less need of them. Hand lights, bell glasses, and the propagating boxes made of cheap tile-ware, may be rendered serviceable at all seasons of the year in the multiplication of plants, and the enthusiastic plant-grower will soon learn how to make them repay their cost a dozen times over every year. The necessity for such contrivances arises out of the fact that a moist, warm soil, and a still, moist, warm atmosphere, are peculiarly favourable to the germination of seeds and the rooting of cuttings, and if the amateur will always bear this fact in mind, the business of propagating will be no longer a perplexity and a worry, but one of the most delightful amusements.

In sowing seeds select the compost in which it is recommended the plants should be grown, and add about a fourth part of its bulk of sand to it. Shallow pans are useful things for seeds, but wooden boxes answer equally well. The depth seeds are sown is regulated by their sizes: those as large as a pea may

be fully one inch deep, and those of smaller size in proportion. It is of the utmost importance, however, for the amateur to bear in mind that small seeds of all kinds should be covered with the merest dusting of soil, for many are lost through being sown too deep. It is good practice to lay a square of glass over a seed pan when the seed is sown, to prevent evaporation, because, if the soil is sufficiently moist when the sowing takes place, it will continue so until the seeds germinate if covered with glass, and thus the necessity of watering will be obviated. If you cannot cover the pans with glass, sprinkle a little clean moss over, or lay a sheet of paper over, and be sure to remove the moss or paper as soon as the sprouting of the seed is visible. When the little plants have grown sufficiently large to bear separation they must be potted two or three together, or separately in small pots, or they may be pricked out into boxes, with a view to a separate potting at the next stage.

By far the largest proportion of greenhouse plants are raised from cuttings, and in the case of soft-wooded plants, the process is so simple, sure, and speedy, that there need be but little said about it. As a rule it is a difficult matter to strike cuttings of hard-wooded plants, but the compensation for the difficulty is found in the fact that no one is in want of large quantities of such plants, and as well-made young heaths and such like can be purchased at a very low price, the propagating business need not stand in the way of the formation and good keeping of a pretty collection. The amateur must begin practice with plants of soft texture, such as fuschias, pelargoniums, and veronicas. Any of the young shoots of these may be made into cuttings at any time of the year. Preference should be given to shoots that are somewhat firm, but still in a growing state. In the case of fuschias they may be broken off at the joint by a slight pressure of the thumb, the shoot having its own "heel," and its removal causing a slight scar on the parent stem. If you cannot do this dexterously cut the shoots with a sharp knife, and in every case let the cuttings be from two to four inches long, and remove from them a few of the lowest leaves, so as to secure a sufficient length of clear stem to insert them firmly in the soil. The more leaves a cutting can carry and keep the better, but there must be no leaves buried in the soil, and any leaves that "flag," or droop from exhaustion, will do more harm than good. Cuttings are

usually put in sand first, and as soon as they begin to form roots, are taken out and potted in light compost. This is not always necessary, especially in summer time, when quick-rooting cuttings may be put singly in small pots in proper compost, and will at once make plants and occasion very little trouble. It may always be known when cuttings are throwing out roots, as their tops become greener, and begin to grow simultaneously with the emission of roots from the base. Then they should have a little more air and light to prepare them for the life they are to lead as independent plants. A cheap propagating frame may be extemporised by fitting together two flower-pots and filling the space between them with moss or sand, and then fitting a bell-glass over. This plan answers well for hard-wooded plants, which are very slow in making roots, and are apt therefore to be neglected, and, perhaps, occasionally forgotten.

The multiplication of stemless plants, such as the cineraria and primula, is accomplished by division of the root where named varieties are required, but when the cultivator has no



DOUBLE FLOWER-POT FOR STRIKING CUTTINGS.

wish to keep a named collection, and desires only to have plenty of gay flowers, seeds are to be preferred. In dividing *these herbaceous* plants, the "stool" is cut through so as to

divide it into as many plants as it has centres of growth, each portion having a few roots attached. The best way to learn the art is to practice on stools of chrysanthemums in spring, for they are easy to divide, and the destruction of a few by unskilful handling will not entail a serious loss.

A considerable number of useful plants may be propagated from leaves, and the practice is of great value when it is desired to obtain stock of an expensive variety. In the case of begonias and coleus, which may be increased in this way, the leaves are merely laid on a surface of moist sand, and kept in their places with little wooden pegs. Sometimes the leaves are clipped partly across by a pair of scissors to hasten the production of roots and buds. In the case of several succulents, such as echeverias, the leaves are removed so as to leave a clean scar on the stem, and are fixed with their bases on or in a surface of sand by driving a little peg through them. The time to remove the leaves for the purpose is when they are "ripe," that is full grown, quite mature, but not yet showing signs of decay.

CULTIVATION consists in providing at every stage of the life of a plant conditions favorable to increase of the individuals or full development in any form desired (and possible) of individual specimens. The treatment to which the principal groups or classes of plants are to be subjected for the attainment of these ends will be described in the chapters that follow, but a few important generalities may be usefully disposed of now. In any and every case it is well to wait until a plant has filled with its roots the pot it occupies before shifting it into one of a larger size. In any and every case it is well to "stop," that is, pinch the points of the shoots, or prune with the knife, some little time before the shift is made, and to give the shift when the new shoots that the stopping process has caused the plant to produce have grown about half an inch or so. In other words, never stop and shift at the same time. A "large shift" means transferring the plant to a pot two or three sizes larger than the one it occupied before the shift. This practice is followed with advantage in the case of fast-growing and free-rooting plants of soft texture, such as the hydrangea, for example. A "small shift" means transferring to a pot only one size larger, and is the only safe practice with slow growing plants of hard texture, such as the erica. The

amateur is advised to practice small shifts until some experience has been acquired, for if a plant does not quickly fill its pot with roots, it is apt to grow smaller instead of larger. Reasons could be given for all these directions, but we have enough to do with work in this little volume, and if we begin to philosophise, we may not only waste time and space, but be tempted to forget work and indulge in essay writing.

THE INSECTS AND DISEASES that injure and not unfrequently destroy plants may be kept at bay to a wonderful extent by good cultivation. As a rule, the appearance of green fly, red spider, scale, or mildew, is an evidence of debility in the plant—it may be through too much or too little food; it may be through too much or too little heat; it may be through downright neglect of the most ordinary rules of cultivation. The best remedial agents are air, water, and light; but in aid of these we are compelled occasionally to employ tobacco, soap, sulphur, lime, charcoal, soot, and patent preparations made of no one knows what. A slight dusting with tobacco powder will generally make an end of green fly or aphis without harm to the leaves dusted, but when all the plants in a house are covered it will be well to fumigate, and any machine will answer the purpose that will quickly diffuse an impenetrable cloud of *cool* smoke, the fuel being the strongest shag tobacco. The little mite called "red spider" usually appears where the stock is kept too hot and too dry; hence atmospheric moisture and a good watering of the roots of the plants will generally dispose of him to the satisfaction and advantage of the amateur; but if a medical agent is wanted provide some means of *slowly* diffusing the fumes of sulphur and you will settle him certainly. But beware, for if you diffuse sulphur fumes rapidly, whether by the aid of burning coals or otherwise, you will probably kill all the plants in the house. The safe way, if the fire is going, is to paint the pipes with a mixture of clay and sulphur, and if the fire is not going it is best to fumigate. Before fumigating the plants should be quite dry and the house closely shut. Make so much smoke that you can see nothing and thus leave the matter until the following morning, when the whole stock should be well syringed with soft water, and an hour afterwards air should be given. Slight dustings of flowers of sulphur will usually *destroy the mildew.*

CHAPTER V.

GREENHOUSE HERBACEOUS PLANTS.

ALL the plants in this section increase quickly and flower profusely if grown in a moist atmosphere in houses of low pitch, in which the temperature is never allowed to go below 40°; but in lofty and airy structures, particularly if the air be dry, they will never prosper; but they may be taken into large houses, when in flower, for decorative purposes, and if they suffer a little then, their deterioration will not be manifested until they have served their purpose and may be destroyed or restored as may be desirable.

The reader must not be dismayed by the word "destroyed," for the essence of success in this department consists in raising a fresh stock of plants every year, and, as a rule, it is not only unwise, but positively injurious, to the garden to keep any greenhouse herbaceous plants beyond one season. However, we shall meet with several exceptions to the rule as we proceed; but it is well the destructive policy should be brought forward in good time, because it is a settled article of faith with beginners in plant culture that a pretty plant should be preserved at any cost, even if the labour alone, more wisely bestowed, would ensure fifty plants as good or better than the one petted by mistake. Herbaceous plants thrive in brick pits that have sufficient piping to keep out frost, and there are two circumstances in their favour when so grown; they are always close to the glass, and the pots stand on a moist bed. The section includes annuals and perennials: a few of them are hardy garden plants, and all of them are characterised by absence of permanent stem and capability of increase by the division of the "stool," the natural production of off-sets, or the simple process of sowing seeds.

AMARYLLIS.—The florist's "amaryllis" is the *Hippeastrum* of

the botanist. Of this noble family there are many splendid named varieties in cultivation, but those who understand them are very few indeed; they are usually grown in stove heat, and are propagated from offsets. Now, the right way to enjoy them is to grow them in the greenhouse and raise the stock from seed. If named varieties are wanted, they can be easily obtained: and of necessity the cultivator must wait for offsets to increase his stock, if desiring to have the named sorts reproduced in their integrity; but seedlings are easily raised, and they are sure to produce fine flowers if the seeds are saved from the best named sorts, and amongst them we shall occasionally find novelties worthy to be named and added to the most select list. We will suppose, then, that you have a few of the best-named amaryllis in flower, and intend to propagate from them.

Light and air are essential to the thorough maturation of the seed; therefore, as the plants go out of flower, they should be placed in a light airy position in an intermediate house where a genial growing temperature is maintained, and where they can be screened from the direct rays of the sun. The seed should be sown immediately it is ripe in light, sandy soil, and well-drained pots or pans, which should be placed in a melon or cucumber frame. After the plants are nicely up, and have from three to four leaves each, prick them off at once into five-inch pots, putting about half a dozen bulbs in each. Keep them steadily growing through the winter in a temperature of about 60°, and give just sufficient water to keep the foliage fresh and green. It is not necessary or desirable to dry the bulbs off in the winter: but should any show a disposition to go to rest, by all means withhold water from them, and place the pots in the greenhouse.

In the spring they will require to be repotted. The soil should be good turfy loam full of fibre, mixed with a fifth part of thoroughly-decayed hotbed manure. The compost should be used moderately rough, excepting for the first potting, as the bulbs are then small, and will not readily root into rough stuff. When they are potted off singly into small pots, the soil should be chopped up rather fine, and of course a liberal quantity of silver sand added. For the first potting from the seed-bed use three-inch pots, and at the spring potting shift into either five- or six-inch pots, according to the strength of *the individual* bulbs.

It is not well to disturb the roots of amaryllis frequently; a fresh pot once in two or three years is enough, and will grow better plants than can be accomplished by the annual shift usually practised.

As the bulb should stand in the same pot two or three years, particular attention should be paid to the drainage, and a few pieces of rough turf placed over the crocks to prevent the soil running down amongst them. The crocks should be packed with care, and there should be no stint of them.

The spring is the best season for repotting, because the bulbs are then starting into growth and make their new roots in the new stuff, and have all the advantage of it from the first. It is a good plan to repot a portion every spring, and not to allow a single flower on the lot last potted, but to pinch out the flower-buds as soon as they appear. Always pot firm, and always give them a substantial loamy compost.

Amaryllis will stand forcing very well, but it is not advisable to start them too early if required for conservatory decoration, as that structure will be too cold for the tender growth and flowers. Generally speaking, forcing should begin about the end of February, and those which show the most prominent signs of activity should be started first. To keep up a succession, draft out a batch every three weeks, as long as they last, and place them in warmth to start, each time selecting the most forward for pushing on. It is a mistake to suppose that they require strong bottom-heat for starting them into growth, and, indeed, the common practice of putting them on a strong bottom-heat is injurious, and accounts for the alleged difficulty of growing them, and the fewness of those who make the attempt. In a plant-house, the temperature of which averages 60° in the spring, amaryllis will start into growth well and flower superbly, and may be thence drafted to the conservatory, and there remain until their glory is past. While in the conservatory they must be protected from cold draughts, and when done flowering should be returned to the greenhouse to finish their growth.

A decided season of rest is essential to the bulbs, but it is a serious mistake to suppose it to be necessary to place them contiguous to the heating apparatus, and hundreds, nay, thousands, of bulbs are injured annually from this cause. It is also worthy of observation that the drying off must be done in a gradual manner. When this is accomplished properly the

foliage will sometimes remain fresh and plump for a couple of months without water. So long as the plants are thoroughly at rest, it matters not whether the foliage dies away altogether or a few leaves remain green throughout the winter. Bulbs preserved in the way suggested will flower with double the strength of others wintering in a high temperature.

When first started, one good watering to wet the soil thoroughly will be required, and then no more must be given until it is nearly dry again. From this stage increase the supply according to the progress of the plants; when in full growth more liberal supplies will be necessary, but over-watering must be carefully guarded against in all stages. After the first year regular supplies of weak manure water will be of great assistance in promoting a vigorous growth. When the full growth is made the water must be given at longer intervals, but must not be entirely withheld, that the foliage may die off in a gradual and natural manner.

ANOMATHECA.—*A. cruenta* is grown in every garden in Europe, and is esteemed one of the choicest gems of Flora's garland. There are two ways of treating it: one is, to flower it in pots in the greenhouse or frame; the other is, to put it in pots to grow for a time, and then plant it out in the front of a border. A mixture of loam or leaf-mould, or peat with plenty of sand, will grow it to perfection. When grown in pots, they must be kept *quite dry in the pots* till the time for potting them in fresh soil. If wanted to bloom early, pot them after the leaves have been withered a fortnight, keeping the pots during that period on a hot shelf; then pot them, and place in a gentle warmth. The *Anomatheca cruenta* may be multiplied by sowing the seeds in spring on a gentle hot-bed, and by dividing the bulbs at the time of planting. It is a great favourite as a window flower.

ASTERS belong rather to the flower-garden than the greenhouse; but as they are valuable when well grown in pots, they must have a place here. We must assume that the reader has obtained a pinch of good seed, and having sown it in a cold frame in April, is in possession of a nice lot of young plants ready for planting out. Select from these a sufficient number of the healthiest plants, no matter how small, and put them in pots for the conservatory.

Asters require a moderately rich soil to do them justice. The compost in which they will succeed best when in pots is turfy loam and decayed manure from an old hotbed, prepared by mixing three parts of the former to one of the latter. Five- or six-inch pots are very suitable sizes in which to grow them, and two or three plants should be put in each; a few may be potted in eight-inch pots: put three plants in a pot for special purposes.

In preparing the pots place three or four moderate-sized crocks in the bottom: then fill with prepared soil, and prick out the plants at equal distances apart round the outside. Each pot should be filled with plants that will produce flowers of the same colour, otherwise the effect will be far from satisfactory when they are in bloom. After they are all pricked off, plunge them in a bed of leaf mould, or partly decayed manure in the borders. In either case the pots must stand upon a hard bottom to prevent the worms getting into the pots. When leaf mould or manure is used it is a good plan first of all to make up a bed of coal ashes, and then only put sufficient material to reach to the rim of the pots when they stand upon the ashes. When plunged in the border a pot must be placed in an inverted position in the bottom of the hole to stand the other upon, and they must not be crowded.



PÆONY-FLOWERED GLOBE ASTER.

After the pots are filled with roots, water with liquid manure, if convenient to do so; but if not, be content with watering with clear soft water. They must not, under any consideration, be allowed to suffer for want of water, and in dry weather an occasional sprinkle overhead will be of immense benefit. They should be taken to the conservatory as soon as they begin to show colour, and placed in an airy, open position, if practicable.

The best for pot culture are the varieties of the *Dwarf Chrysanthemum-flowered* and *Pæony-flowered*, which seldom exceed a height of twelve inches, and require little or no support. The most distinct varieties are those with *rose*, *carmine*, *violet*, and *pure white* flowers.

ASTILBE.—The well-known *Astilbe Japonica*, which is, perhaps, better known as "Spiræa Japonica," is eminently valuable to furnish greenhouse flowers early in the spring, though it is a cheap hardy herbaceous plant. When forced slowly in a damp pit, close to the glass, it is one of the loveliest plants in the world, and well worthy to be made a feature of in any private garden where beautiful plants are valued by some other scale than their money value in the market. They should be potted in September or October, in a mixture of turfy loam, leaf mould, decayed manure, and sand, and started in a temperature of about 55°. From this allow the temperature to rise gradually to 75°. They should be supplied liberally with water when growing freely, and may be placed in pans of water to advantage. It is a matter of no consequence what sized pot is employed, but for ordinary decorative purposes five-, six-, and eight-inch pots will be most serviceable; the two former for the drawing-room jardinets, and the latter for the conservatory. Strong clumps ready for forcing may be purchased at nurseries and seed-houses, those who prefer growing them for forcing in after years may do so with but little trouble. Early in May or June they may be planted out in an open quarter previously well prepared for their reception. They should have two or three liberal waterings and a mulch of short litter, or partly decayed leaves, placed between the rows, if it can be spared. They will then require no other attention, and by the autumn will have formed strong crowns and be in grand condition for forcing. If considered desirable, they may be divided into single crowns in May, each of which

will form a nice little plant by the end of the summer. Those who have not convenience for forcing may have a fine display early in the season by simply keeping them in the greenhouse from the time they are potted until they come into bloom. Of course they should be placed in an out-of-the-way corner until the young growth begins to push, and then they should be placed in a position near the glass.

BALSAM.—The *camellia-flowered* varieties make superb conservatory plants if well grown. The seed should be sown in March, in a gentle bottom-heat, and the plants should be potted off singly as soon as large enough to handle, and as fast as they fill their pots with roots should be shifted on to larger and larger pots, until they are required to flower, and then there must be no more shifting. Very nice plants may be grown in five-inch to nine-inch pots, and they are better grown singly than several in a pot. The compost should be rich; the plants should never have the least check through cold or want of water, and if they show flower-buds while they are yet too small to be allowed to flower, pinch them out, and keep the plants growing by shifting on.

BEGONIAS belong much more to the stove than the greenhouse, but they are such universal favorites that we dare not exclude them from this work. With the aid of a hotbed a number of fine begonias may be grown in a greenhouse, but if there is no hotbed, the selection must be restricted. The ornamental leaved kinds, such as *Rex*, may be kept under the stage all winter in their pots laid on their sides, and if quite dry, will be ready to start into a free growth with the aid of a moist heat in spring. The sorts that flower in winter, however, are of no use for the greenhouse, as they must have, in the dead season of the year, the comfort of the stove. However, as a few good sorts are nearly hardy, and the tender ones are accommodating, we can fairly include begonias amongst greenhouse plants. To make plants is a very easy matter. The stemless kinds are propagated by means of the full-grown leaves, in the same way as the ornamental-leaved varieties are. But all that have a shrubby habit are readily raised from cuttings of the young wood in the spring. The cuttings should be taken off about a couple of inches in length from the fresh healthy tips of the young shoots, and inserted firmly in sand

under a bell-glass. It is not advisable to keep cuttings of this class of plants either too close or too moist, on account of their succulent nature, and they must not be exposed to very strong light, more especially sunshine, until after they are nicely rooted.

As soon as the cuttings begin to grow, they should be potted off either singly into 60's, or, if a good specimen is wanted at the earliest possible moment, it is a very good plan to put three plants in a 48, and return the pots to a nice gentle hot-bed until the young roots begin to feel the sides of the pots. The plants after this should be kept in a growing temperature moderately charged with humidity, say about 70° or 75°, and partially or wholly shaded from the sun, in proportion to the age of the plants and the clearness of the atmosphere. Specimens two or three years old will stand an amount of sunshine that would totally annihilate young tender plants a few months old that have been growing rather quickly. The temperature and atmospheric conditions of an early vinery are as close an approximation to the amount of heat, moisture, and shade experienced by them in their native localities and habitats as we can conveniently secure. They should have every encouragement to grow strong by being potted on as fast as they require it, until they reach 24's or 16's—either is a good size to flower them in, but the last size should not be exceeded; and they should be managed so that the growth is completed by the end of August, to afford plenty of time to ripen the wood, and induce an abundant formation of flower-buds. This end will be best secured by placing them in a comparatively cool and airy house for a time, and then throughout the whole of the winter and spring months they will flower abundantly in a warm greenhouse.

As soon as the flowering season is over of the winter blooming kinds—say, for sake of clearness, the middle of March—they must be pruned, but not too hard; and when they begin to make new shoots, take them out of the pots, reduce the ball of soil, and repot in the same size pots again. If the pots are then partially plunged in a bottom-heat of about 75° or 80°, the plants will speedily start into growth again. Bottom-heat is not indispensable, and equally as good growth will be made, though not so quickly, if they are placed upon the shelves of the stove or vinery. Keep rather dry at the roots until they begin to take possession of the fresh soil, and syringe over-

head once or twice a day. When in full growth water freely, avoiding excess, and once or twice a week, after they become pot-bound, give them weak liquid manure. During the winter water cautiously. The tuberous-rooted species must be dried off, and the pots turned on their sides to prevent the soil getting wet.

It is of great importance to pot them in light rich soil, through which the roots can travel freely. A very suitable compost may, however, be formed with good turfy loam and leaf mould, mixed in the proportion of two parts of the former to one of the latter. The loam must be broken up roughly, and, after adding the leaf mould, a good sprinkling of small crocks and a liberal proportion of silver sand should be mixed with it, to keep the mass open and porous, this condition being of the utmost importance.



BEGONIA VEITCHI.



BEGONIA ROSÆFLORA.

The most hardy kinds are *B. rosæflora*, a stemless species, which flowers well in a cool greenhouse; *B. Weltoniensis* (also known as *B. Clarkei*), which is one of the best window plants: and *B. Veitchi*, which is hardy enough to plant in the open garden in a sheltered spot. For winter flowers the best are *B.*

fuschioides, *B. Ingrami*, *B. parviflora*, and *B. diversiflora*. The last is a beautiful and accommodating plant, which can be flowered in a cool greenhouse in the summer, or in a warm house in winter. *B. Sutherlandi* is equally useful; the flowers are orange red.



BEGONIA WELTONIENSIS.

BLANDFORDIA.—A pretty genus of half-forgotten Australian lilies which have lately regained a small degree of their former popularity owing to the introduction of *B. Cunninghami*, a

very showy orange-flowered species. Treat the same as ixia,



BLANDFORDIA CUNNINGHAMI.

but do not dry them off, as they keep green the whole year round. The soil should be sandy peat.

CALOCHORTUS.—This rare and beautiful American lily may be grown in the same manner as recommended for *Lilium speciosum*. It is the custom to "dry off" the bulbs annually, and the rarity of the plant may be ascribed in part to the destructive tendency of the practice. No soft bulb should be allowed at any season to become quite dry; when grown as a pot plant, frame-culture is sufficient; the soil should be a rich light loam. The time to repot the bulbs is September or October. They may be planted out in May if kept in pots in



CALOCHORTUS VENUSTUS.

a frame all the winter. The finest of the genus is *C. venustus*, which produces large white flowers, blotched with lilac, red, and yellow, but any calochortus the amateur may obtain will prove worth cultivating.

CINERARIA.—This beautiful flower is always in great demand, and deserves the best attention the amateur can bestow upon it. The flowering season extends from November to May, but, as a rule, cinerarias are flowered from February to April. A fine display may be obtained from seedlings, but the named varieties are so grand in form and colour that those who have had some practice with the flower would do well to give atten-

tion to a named collection. We will suppose you have secured a few of the finest named varieties, that they have flowered to your satisfaction, and you have now to look out for nursery stock. The first step will be to remove the flower-stems before the flowers have quite finished their career, for if you allow seeds to form you will get no offsets. Put the plants in a cold frame, keep them regularly supplied with water, and take the lights off and let them enjoy full exposure to the weather as soon as the season is advanced enough, and do not on any account allow them to be roasted by a hot sun. They may be planted out in May, but they must not be forgotten afterwards. In the first week of August you may look for offsets. Take them off carefully with a bit of root to each, and put them four or five in a five-inch pot, each offset next the pot and touching it: give them a sprinkle and shut them up in a cold frame. Keep them close and shaded and regularly sprinkled, and they will soon be plants, when they must be potted off singly in three-inch pots and be sprinkled for a few days and then have plenty of light and air.

Now it must be confessed that although the cineraria is a greenhouse plant, it can always be better grown in a brick pit than in any greenhouse, for an equable temperature and a certain degree of humidity which does not reach the stage we term "damp" is required for its perfect development. But not one degree of frost must ever touch a cineraria, so the greenhouse is the proper place to winter the stock unless the pits are heated. From the time the offsets are well started until the beginning of November, the plants should be shifted on as they fill their pots with roots, and six-inch pots are the largest size they can be put in the first season, and, as a rule, very nice plants may be made in five-inch pots, if they are assisted when pot bound with weak manure water, It is a nice task to keep the same plants on from year to year, but if it is well managed you may have them three feet across in the third year, forming gorgeous hemispheres of colour. During winter use as little fire-heat as possible; just sufficient to keep out the frost, with the aid of a covering on the glass. When exposed to much artificial heat the leaves will curl, and the plants be more or less spoiled. On the other hand, a little artificial warmth in very dull and damp weather will be of considerable service to maintain a sweet moving atmosphere.

Damp and mildew are the principal enemies to the cineraria,

but both are easily kept in check if taken in time. The best remedy for mildew is flour of sulphur dusted over the foliage, and for the destruction of the green-fly nothing can equal tobacco-powder. The latter should be applied after the foliage has been wetted with the syringe, and washed off again in about twenty-four hours afterwards. Green-fly can be destroyed by fumigating with tobacco-paper, but the tobacco-powder is applied more easily and is safer.

The plants must be watered carefully at all times, especially during the winter. They must have sufficient water to maintain a vigorous growth, and no more; but they must not, under any consideration, be allowed to go quite dry. Use soft water until the end of January, and then substitute weak liquid manure for it. The plants should be syringed lightly overhead every afternoon until the end of September, when syringing must be discontinued.

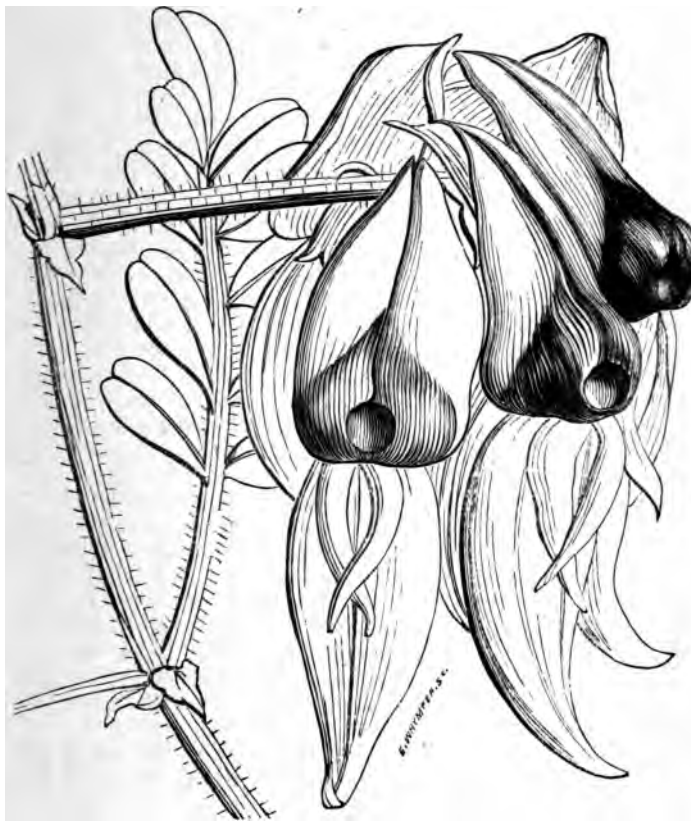
Where seedlings are grown, those from which it is intended to save seed should, as soon as the first flowers are expanded, be removed from the general stock, and placed in a frame by themselves to prevent their being fertilised with pollen from the worthless sorts. This is a very easy matter, because a very few plants will furnish an ample supply of seed for the generality of gardens. The seed should be saved from plants compact in habit, and with well-formed distinctly-coloured flowers. Where seed is saved from a collection of first-rate named varieties, it will not be necessary to separate the seed-bearing plants from the general stock. As the flowers begin to fade, place the plants in a light airy position to insure the seed being thoroughly matured, and gather before it is blown away and lost.

Sow the seeds in the first or second week in July in five-inch pots. Make the surface perfectly level, and cover with a very thin layer of sandy soil. The pots should then be placed in a cold frame, and constantly shaded from the sun until the young plants begin to show above the surface, when the supply of light and air must be increased. Directly the seedlings have two rough leaves, prick off into seed-pans or round the sides of the same-sized pots, and in the same manner as advised for the offsets; and, like the latter, they must be potted off as soon as established.

The universal compost will suit cinerarias admirably, but if a compost has to be made for them, let it consist of five

parts mellow turfy loam, one part rotten manure, and one part silver sand.

CLIANTHUS.—The "glory pea" of New Zealand, *Clianthus Dampieri*, is a fine plant for greenhouse culture when carefully trained to a trellis or wire balloon. It is grown from seed,



THE GLORY PEA (*Clianthus Dampieri*).

and is strictly a biennial, as it flowers the second season and

after flowering dies. In the cultivation of this fine plant the principal matter of importance is to guard against giving it the slightest check at any stage of its growth, the roots being of delicate texture, and having no power of recovery from injury. In February sow the seed singly in small pots filled with a mixture of three parts powdery peat and one part sand, and place in the coolest part of a stove, or the very warmest corner of the greenhouse. When the plants have made their third joint shift into forty-eight size using the same soil as before but in a rather lumpy state. When the roots have fairly filled the pots the plants must be put out on a border in a cool conservatory in a position where they will enjoy abundance of sunshine. The border should be prepared by opening a trench two feet deep, laying at the bottom a bed of small empty flower-pots placed bottom upwards on a similar bed of cheap tunnel-shaped drain pipes, and filling up with a mixture of the very best turfy peat and a fifth part sand. In this plant carefully, leaving the collar of every plant a little above the level. Water cautiously, keeping the roots always moist but never wet, and train out the growths from the first to a light trellis a foot from the glass. One plant will, in most cases, be sufficient for an ordinary conservatory. If grown in a pot a very large one must be chosen, and the plant put into it at one shift from forty-eight size, as it will not bear frequent disturbance of the roots.

CYCLAMEN.—The lovely *C. Persicum* has become one of the most popular plants of its class within the past few years in consequence of the improved method of cultivation we initiated in 1863, when the "rapid culture" system was announced in the "Garden Oracle." Previously, it had been customary with growers to "dry off" the corms, and in so doing dry half the life out of them, but we pointed out the folly of this procedure, and those who acted on our advice made such wondrous displays of cyclamens at the horticultural exhibitions in London that the slower class of gardeners were at last convinced. The instructions that follow are few but sufficient; those who will follow them faithfully will have good reason to rejoice in due time.

The only safe way to begin is with the best seed that can be obtained. Cyclamens may be increased by division of the corms (or bulbs), but it is a difficult process and we should

waste the reader's time in attempting to explain it. As soon as the seed is ripe, which is generally the case in July, it should be sown in pans, filled with equal parts of peat, loam, and leaf-mould, with the addition of a moderate quantity of silver sand, and a good drainage in the bottom. The compost must be broken up rather small, without sifting, so that the young plants can be taken up, when the time arrives for potting them, without injuring the roots. The seed-pans should be placed in a close part of the stove or cucumber-house, or on a moist hotbed, where they will have the benefit of a mean temperature of 75°. As the young foliage begins to show nicely above the surface, a light position, with rather more air, and not quite so warm, will be more suitable for them. Great caution is necessary in watering at this stage, as the plants have to remain some time in the seed-bed.

By November the corms will have attained considerable dimensions, and be ready for potting off separately. The same soil must be used as before, and the plants lifted carefully and potted firm, the corms on the surface, in small 60's. The weather will not permit much air at this season, but they should be placed near the glass, and a temperature of 55° or 60° maintained. As the days lengthen, a rise of five degrees may be allowed, with more liberal ventilation. Early in May, remove the plants to a cold frame in a rather shady position, and keep them growing steadily until the end of August or beginning of September. At this stage they will require shifting into five- or six-inch pots; the largest size should only be used for the very largest plants, as they do very little good if overpotted.

There should be a slight alteration in the compost at this potting by taking away half the leaf-mould and replacing it with the same quantity of fresh horse-droppings, dry enough to mix readily. The cold frame will be the best place for a month afterwards, as it can be kept rather close, to promote free rooting in the new soil.

In October, remove the stock to the greenhouse near the glass where they will enjoy a humid atmosphere and an average temperature of 50°. They must be watered with great care, with water of the same temperature as the house. They will soon begin to flower and may then be taken to the conservatory, where their elegant fragrant flowers will charm away all the gloom of the winter season.

In March, remove them to a cold pit and keep them rather dry, but not dust dry, and take care that the pots stand on a moist surface, as absolute dryness of the roots is death to the cyclamen. When the seed is ripe gather and sow, and then repot the old corms, taking care to shake off the exhausted soil without in any way injuring the roots. None but experts should ever dream of using liquid manure in the culture of the cyclamen.

DIELYTRA.—The pretty Chinese fumitory, *Dielytra spectabilis*, with lyre-shaped flowers of the most delicate pink colour, and the white variety called *alba*, are two valuable plants for early



DIELYTRA CUCULLARIA.

flowering, to keep company with hyacinths, tulips, and cyclamens in the dressing of the conservatory in early spring. The best way to manage the dielytra is to have two sets of plants *and pot them* alternately in September, and plant them out

in May, thus giving to each patch a whole year of growth and rest. They should be potted in pots proportioned to the size of the roots in a rich light loamy compost, and have the least possible amount of forcing. If they are kept in pots the whole year round, they should be put in a damp and shady part of a cold pit after they have flowered, and be kept well supplied with water until the leaves die down, when they should be shaken out and repotted. The pretty *D. eximia* and *D. cucullaria* are worth growing in pots to decorate the house in spring. They require only the simplest frame culture.

HYACINTH.—As we are desirous of cramming into this little book the largest possible quantity of valuable information, we will say nothing about the beauties of the Hyacinth, but proceed to offer brief but sufficient directions for its cultivation as a conservatory plant. In selecting varieties for pot culture it is advisable to have equal quantities of single and double flowers. But for growing in glasses the single varieties are to be preferred; while for bedding in the open ground the best are those of the most decisive colours, whether single or double, but the single, as a rule, are to be preferred. One of the most important points is to select hard, sound, well-ripened bulbs, for the fine spikes of bloom cannot be had from those that are soft and spongy, even if they are large in size. The growth must be prolonged over as long a season as possible, and consequently early potting must be practised. Pot the bulbs as early as possible after they arrive in the market, especially if they are wanted for very early flowering, and have to be forced. This will give them plenty of time to form roots and get well established. When this is accomplished before they are placed in the warmth, there will be little danger of any of them refusing to push up the spikes at the proper time. "Dumpiness" may be safely attributed to the bulbs not being properly furnished with roots, and it is a waste of time to put paper caps over them with the idea of drawing the spikes up. The fault lies with the roots, and if they are all right there will be little or no fear of a failure. Good turfy-loam and well-decayed manure, at the rate of three parts loam to two of manure, chopped up roughly and mixed with a sixth part of silver sand, forms a capital compost for hyacinths as well as other bulbs.

Use five-inch pots, and let them be well drained, by placing

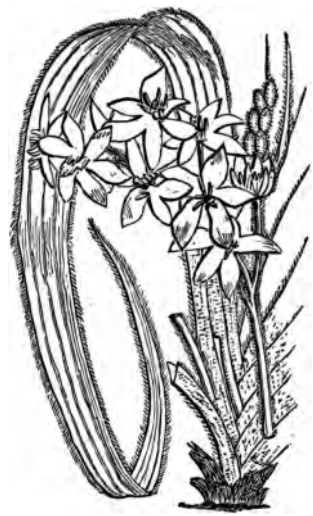
a layer of crocks in the bottom. Put one bulb in each pot; press the soil slightly firm in the pots, and when they are filled to within an inch of the rim, insert the bulbs and fill the soil firmly about them. The neck of the bulb should show just above the soil. When they are simply placed on the surface with a little loose soil about them, the weight of the spike will probably topple them over. The soil should be used in a moderately moist condition, and then no water will be necessary until they come from the plunge beds. When all are potted, make up a good bed of coal-ashes and stand the pots upon it. This done, turn a small sixty-pot over each bulb, and cover with coal-ashes, spent hops, or cocoa-nut-fibre refuse, to the depth of six or eight inches. Here they should remain for five or six weeks, and then be brought into the forcing-house as wanted. The young growth must be inured to the light in a gradual manner, and the plants kept near the glass. After they are well started into growth, water liberally, and let them have a breath of fresh air during the warmest part of the day; but it must be admitted without chilling the tender growth.

The bulbs must not be left in the plunge bed long enough for the foliage to grow long and become blanched. Therefore, when the flowers are not wanted until late in the spring, lift them out of the plunging material and place them in a cold frame or pit, where light and air will have free access to them. Those for early flowering must not be exposed to a great heat, or the flower-spikes and foliage will be drawn up weak and spindly; and at all times keep as close to the glass as possible, because neat, properly-developed foliage, that will maintain an erect position without support, is nearly of as much importance as good spikes of flowers.

It is a waste of time to pot hyacinth bulbs a second season, and, therefore, to secure an annual display there must be an annual purchase. But the bulbs may be turned to good account in another way. When the flowering is over, put them in a cold pit or frame and take reasonable care of them until they are beginning to die down. Then plant them all out without breaking the roots in the shrubbery or hedgerows and forget them; they will in time remind you of their existence and supply you with welcome garlands of bright and fragrant flowers.

HYPOXIS.—This genus of Cape bulbs supplies a few choice

plants for the greenhouse. They require the same course of cultivation as the Ixia. *H. stellata, H. latifolia,* and *H. elata* are the best species.



HYPOXIS ELATA.

IMANTOPHYLLUM.—This is a fine genus of Amaryllids, requiring warm greenhouse culture. *I. miniatum* is the best, but *I. Gardeni* is worth growing for its winter flowers. A strong loamy compost will suit these plants, and they must be kept growing the whole year round. To dry them off would be certain death to them.

IXIA AND SPARAXIS.—The Continental growers have been outstripped by the English in the cultivation of these most elegant flowers. The English growers are not content to grow them only; they hybridise them with much care, and have raised hundreds of new varieties. In the Channel Islands they are treated as hardy flowers, but with us they require frame or greenhouse culture.

To grow the Ixia in pots put three to seven bulbs in a

6-inch pot in a mixture of maiden loam, bog earth, and leaf soil, with plenty of sand. Put the bulbs in the soil so that they will be covered only one inch in depth. Put them in a frame, and do not cover them with earth or sawdust, but fill in between the pots quite to the rim. Not much water must be given till the cold weather is past. When the frost is severe, mats and straw must be put over the frames. When the spring has arrived, place them on shelves near the glass in airy houses. They now require plenty of air, plenty of light, and plenty of water. When they have expanded all their flowers, put them in a bed out of doors, and put into each pot a little fresh soil on the top. This is beneficial, for when the flowers wither the plants begin to make new bulbs, and the fresh soil will cause the new bulbs to be large and good. As the old bulbs die, it is worth obtaining good ones for the next season. When the leaves begin to die, give them no more water, but put them in a dry frame in the sun, and put the glass on, or lay them on their sides in a hot sunny greenhouse, so that the new bulbs in the pots will be made quite hot for fourteen days or more. Then you may take them all out and pot them for the next season, and you will find large hard bulbs which will bloom the next year better than the first.

LACHENALIA.—These pretty bulbous plants thrive best in a strong yellow loam, but they will flower fairly in any kind of soil. Pot them from June to November to produce a succession of flowers, and when growing freely give plenty of water. When the foliage begins to die down withhold water and put the pots in a dry place where they may remain undisturbed until the season returns for potting them again.

LILIUM.—A certain few, amongst the many fine lilies in cultivation, are of great value as pot plants for the embellishment of the conservatory, but are not often so well grown as they might be. The introduction of the noble *L. auratum* has attracted fresh attention to liliums generally, and the lovely varieties of *L. speciosum* (lancifolium) have been in increased demand and in many instances of late have been presented at exhibitions in a remarkably fine state of development. The modest *L. longiflorum* with its pure white flowers, and the dashing *L. Fortunei*, which is a gigantic variety of *L. tigrinum*, are worth a little extra care to bring them to perfection

In making arrangements for growing liliums in pots it is advisable to grow a portion of each kind in large and a portion in small pots, the former for front rows and the latter for intermixing with the tall-growing subjects at the back. For small specimens six-inch pots should be employed, and one bulb put in each; and for the large specimens pots ranging from eight to twelve inches in diameter should be used, and have from four to eight bulbs in each.

The proper moment for shaking out of the old soil, or for shifting the bulbs into other pots, is as early in the autumn as possible, and the decay of the stems will afford the best indication of the proper time for the work to be done. If it is desired to give the bulbs a fresh compost without increasing the size of the pot, they must be carefully shaken out of the old soil, without injuring whatever healthy roots they may have attached to them. They will not suffer very materially if all the roots are removed when repotted at the period here mentioned, but it is preferable to preserve them from injury, if it can be conveniently done. Those to be shifted into larger pots should not be shaken out altogether, but a portion of the old soil should be removed. It is highly advantageous to shift the bulbs on without divesting them of every particle of soil, for it is in this manner that the magnificent specimens of *L. auratum* which have been exhibited have been obtained, some of them presenting nearly a hundred flowers fully expanded at one time. If shifted early, they will be furnished with healthy roots, which will be of immense assistance in promoting a vigorous growth from the first. On the other hand, when repotted in the spring the production of roots and the growth of the stem go on simultaneously, and a poor bloom is the result.

Lilies should have a rather light and moderately-rich compost, consisting of turfy loam one part, fibrous peat one part, and partly-decayed horse-droppings, and leaf-mould, in equal proportions, one part, all well incorporated together. If the peat is not of a sandy character, add a small proportion of washed road-grit, or river sand, or sharp silver-sand. We have frequently used loam containing no fibrous matter whatever, and have made up for the deficiency by the addition of a small proportion of cocoa-nut fibre refuse. The soil must be pressed rather firm, so as to give the plants all the food possible. The drainage must be perfect; and if a few oyster-

shells and lumps of charcoal can be conveniently obtained they should be mixed with the crocks. In any case, the drainage must be covered with a layer of the roughest portion of the compost, to prevent the finer parts running down between the potsherds.

With a drainage such as is here advised the most liberal supplies of water will be required from the time they are fairly in full growth until they begin to go out of bloom. As the flowers fade the supply of water must be lessened, and as the stems decay it should be withheld. The soil, however, must not be allowed to become dust-dry even during the winter, and a moderate quantity of water must be given at intervals to maintain the soil in a nice moist condition. From the time the pots are well filled with roots until the buds are formed, rather weak liquid manure should be used alternately with clear soft water, or very weak liquid manure may be used at all times.

When in growth, a greenhouse or pit where they can be placed near the glass and enjoy a free circulation of air will be the most suitable position; or they may be placed in the open air until the buds begin to expand. During the winter a cold frame, with just sufficient protection to keep the frost from the bulbs, will be the most desirable quarter for them. All kinds of lilies love sunshine, though it is generally believed they love the shade.

LINUM.—The Golden Flax, *L. flavum*, is very showy, and when strong plants with well-matured growth are placed in an intermediate house at the beginning of February, they bloom profusely early in the spring, and are then very desirable. The directions given for the management of the double wall-flowers may be advantageously followed in the cultivation of the Golden Flax.

LOBELIA.—The herbaceous Lobelia is one of the most useful plants we have for conservatory decoration. It is doubly valuable to amateurs who have little room for wintering plants, because it is nearly hardy, and the stock can be preserved in a cold frame, or plunged in a bed of coal-ashes. The plants that have embellished, during summer, the open borders, can be lifted and placed in a dry corner out of doors, and covered with coal-ashes; and if protected from heavy rains

they will take no harm. It is, moreover, a most easy matter to grow them into magnificent specimens.

Supposing you have a few old plants to begin with; some time in February, or the beginning of March, turn them out of the pots, and divide carefully, according to the number required. It is not desirable to divide them into small portions when required for indoor decoration, as a few good specimens have a much better effect than treble the number of small plants with single spikes. An average of four spikes to each specimen is the most suitable for ordinary purposes.

Good fibrous loam, mixed with a liberal proportion of hot-bed manure, will form a suitable compost. Use six-inch pots to commence with, and after potting place the stock in a cold frame until the pots are nicely filled with roots, and then shift them into sixteen-inch pots. Admit plenty of air to keep the growth short-jointed and hardy; and towards the end of May, place the plants out of doors in a shady corner, and be careful to stand the pots upon a bed of coal ashes to keep the worms out. Here they may remain until the flowers begin to expand, when they will be taken to the conservatory.

After the beauty of the flowers is past, remove them to the open air, and cut away the old flower-stem, and in October return to the cold frame, or heap a good thickness of coal-ashes over the pots, and lay a few boards on the top to throw the wet off. Where frame-room is abundant, they may be potted in the autumn with advantage, because it gives them an opportunity to get well established before they start into new growth in the spring.

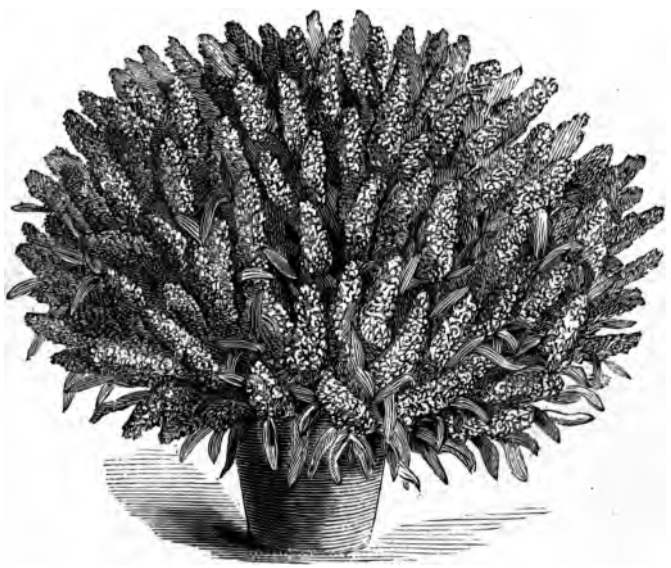
MARICA.—This is a genus of Irids for the greenhouse and the stove. The proper soil for it is a mixture of loam, peat, leaf-mould, and sand, but no manure. The most ornamental species are, *M. Sabini*, *M. cærulea*, *M. Northiana*, and *M. semi-aperta*; the latter is the hardiest, and may be grown in either a greenhouse or a stove. At the foot of each stem on which flowers are borne, young plants are produced; like some lilies, it is viviparous. As for the flower-stem, that arches over until it touches the gtound, and the cultivator should allow it to do so, or the flowers will not open properly.

MIGNONETTE is such a favorite that there will be no question about the propriety of giving it a place here. And,

perhaps, a few of our readers will find that what we have to say upon it is somewhat new as well as useful, for humble as the plant is, we have given it some amount of special attention. In the books mignonette is described as an annual that should be sown where it is to remain, as it cannot with any safety be transplanted. These statements are correct if the cultivator will but allow them to be so, but it is in the power of art to make nonsense of them. When allowed to go on in its own way mignonette is strictly an annual which flowers, ripens seed, and perishes. *But* if we cut the flowers as fast as they are produced, and never allow a single seed pod to be formed, the plant will live any number of years, and continually increase in size if assisted with root room and liquid manure until it becomes a gigantic wonder. We have kept the same plants seven years, and then threw them away because of their unmanageable magnitude. To manage the mignonette as a round perennial bush, and have it in flower the whole year round is most easy. Sow two or three seeds each in 60-size pots in rich, light, loamy compost. From May to August is the best time for this business. When the plants are fairly up pull out the weakest, and leave only one plant in each pot. Keep them in the greenhouse only when the state of the weather compels, for they should make all their summer growth in the open air. As soon as they begin to show flower, and long before the flowers open, pinch out the top of the plant, and a week afterwards shift into 48-size. They will again show flower very soon, and the process of pinching and potting on must be repeated. This, with constant and careful watering, will ensure the formation of fine bushy plants in 32-size pots. If this occurs in winter keep them in a warm place near the glass, and allow the flowers to open, and the result will be a beautiful spectacle, and a diffusion of the most delicious fragrance. Watch the plants closely, and the instant that seed-pods are apparent, cut all the flower spikes away, and prune the whole plant tenderly, so as to keep it round and bushy, and again place near the glass, but do not disturb the roots, for they may stand twelve months in the 32-size pots. As soon as the new shoots appear and another bloom is promised, water with very weak liquid manure, and continue this to make amends for the exhaustion of the soil. When the bloom is again passing, pinch and prune. After they have been in the pots twelve or fifteen months turn them out care-

fully, remove some of the old soil without seriously injuring the roots, and pot them in the same pots, or in pots one size larger, and in these let them stand another year, taking care always to pinch and prune after every bloom, and never allow a single seed pod to swell, or you may lose your plants. The accompanying figure will give an idea of the appearance they should present when first allowed to flower in 32-size pots.

Tree mignonette is obtained by another course of treatment, beginning with the seed of any of the more vigorous growing varieties. The seed should be sown singly in 3-inch pots, and when the plants have filled them with roots shift into 6-inch pots. and from thence transfer them into pots two sizes



SPECIMEN BUSH MIGNONETTE.

larger before they become pot-bound. Extra-sized specimens may at the last shift be put into pots three sizes larger, but for ordinary conservatory decoration 9-inch pots will be quite large enough. The pots must be clean and efficiently drained.

Use a compost consisting of turfy loam three parts, and thoroughly-decayed manure one part, and a rather liberal quantity of silver sand. The plants intended for standard specimens must have all the side-shoots nipped off until the stem has attained the desired height, and then the terminal point must be pinched off five or six joints above where the last side-shoots were removed. Side-branches will soon be produced at four or five joints nearest the top, and these must be stopped when a few inches in length. The main stem will require supporting with a stout stake, and a ring of strong wire should be fixed horizontally near the top, and the main side-branches trained to it. The latter must be stopped as often as may be necessary for the formation of a dense head.

To produce pyramidal specimens, train the leading shoot in an upright manner and stop it once or twice, if necessary, to induce the plants to produce a beautiful proportion of side-shoots, which also must be stopped once or twice. Sometimes the leading shoot will break freely, and then it is not necessary to stop it. The same sized pots and soil should be used as recommended for the standards, and most efficient trainers may be extemporised by a stout stake and a few pieces of wood. After the plants have had their last shift, insert the stake in the centre of the pot; then make a ring of stout wire about two feet in diameter, and with two cross-pieces of either wood or wire. Lay it on the top of the pot, and fix it in its place either with stout pegs driven into the soil, or else fix a piece of wire just underneath the rim of the pot, and fasten the cross-pieces to it; then fasten lengths of thin wire or string to the wire hoop, and bring the other ends to the top of the stake and securely fasten them there. The young growth must then be trained to the trellis regularly. A cold frame will be the most desirable position for the stock until September, when it should be removed to the greenhouse. Liberal supplies of water will be required until August, and afterwards it must be applied in a more sparing manner; but the plants must not at any season of the year suffer through the soil being kept too dry. It will also be needful to sprinkle them overhead two or three times a week during warm weather, but it matters not whether a water-can, to which a fine rose is fixed, or a syringe is employed.

MORÆA.—A pretty genus of Cape bulbs, that may be

grown in the same way as the Ixia and Sparaxis. The best varieties, requiring shelter in winter, are *M. edulis*, *M. lineata*, *M. exaltata*, *M. bicolor*, *M. Collina*, *M. papilionacea*, *M. polystachys*, *M. viscaria*.

PRIMULA.—The Chinese primrose, *P. prenitens*, is a great favorite for winter and spring display, and there are several remarkably fine varieties, both single and double, in the market, those of the last named section being true florist's flowers, with names and histories, and fixed characters. The single kinds are the easier to manage, as we raise them from seed, and when they have flowered throw them away, whereas the double varieties have to be grown from divisions of the stool, and it is a matter of very nice management to make stock or to grow fine specimens. We will begin with the single kinds, which anybody can grow who will take care to secure a supply of first-rate seed to begin with.

To insure a continuous display throughout the winter, make two sowings of seed; the first sowing the last week in May or the first week in June, and the second towards the end of August. The first batch of plants will commence flowering in November, and the second early in January, unless the first flower-buds are nipped out, and in that case the time of their coming into flower will be delayed for a month or six weeks. Sow the seed in five-inch pots, previously prepared by draining them efficiently, and then filling them with a light rich compost. Make the surface of the soil perfectly level, to prevent the possibility of any portion of the seed being buried too deep. Water the soil moderately, previous to sowing the seed, to prevent the necessity of a heavy application of water afterwards. The seed should be covered as lightly as possible with fine sandy soil, and the pots then placed in a pit or house, the temperature of which is maintained at about 60°. It is also important to sow the seed rather thinly, to prevent overcrowding before the young plants are strong enough to prick off. Instead of potting the plants off separately in small pots, when they are removed from the seed-pot, they should be pricked off into seed-pans, and be at once returned to a warm pit or house to promote a free growth. In the course of a fortnight remove them to a cold frame, which will be the most suitable quarter for them until the autumn. When strong and well established, pot off singly into three-inch pots, and stand them upon a bed

of coal-ashes in a cold frame. After the pots are well filled with roots, but before the plants have become pot-bound, shift them into five-inch pots, and as soon as they are well established in these, shift again; the strongest plants into eight-inch pots, and the others into pots one size larger, and that will be the last shift they will require.

The most suitable compost in which to grow these plants is one prepared by well incorporating together three parts turfy loam, and a fourth part consisting of equal quantities of decayed manure and leaf-mould. To this add a liberal sprinkling of sand, and if the loam is deficient in fibre, or the leaf-mould is not available, a small proportion of cocoa-nut fibre refuse may be added, to assist in keeping the mass open. It is scarcely necessary to say that the pots must be effectually drained to prevent the soil becoming sour.

After the plants have recovered from the effects of their removal from the seed-pan to the small pots, ventilate freely both night and day throughout the season, and until danger from frost may be apprehended, and then remove them to a cool and moderately airy house. The plants should be shaded from the direct rays of the sun during the months of June, July, and August. A mat thrown over the glass during the middle of the day when the sun is shining brightly, is all that is necessary in the form of shade.

Water carefully at all seasons, but more especially during the winter months. The best system of watering is to give sufficient to moisten every particle of soil within the pot, and then give no more until the soil has become somewhat dry again. Avoid the use of stimulants, and use soft water only. Liberal supplies of liquid manure are advised by some writers, but our advice is that it be not used at all, for it is more likely to do harm than good.

The whole stock should have a temperature of about 45° or 50° throughout the winter, as the plants from the second sowing will grow freely during that season. To produce large specimens, and also to prolong the season of flowering over as lengthened a period as possible, nip out the first flower-buds of the strongest plants of the second batch immediately they are sufficiently advanced. Do not attempt to keep plants a second season, no matter how promising they may appear, for if they remain in health, the flowers are always small in size and poor in colour, compared with young plants. There is no

gain either as regards size, in preserving the old plants after they have done flowering.

The double-flowering primulas, as above remarked, are awkward things to manage, and the inexperienced cultivator had best for a time be content without them. They may be raised from seed, but the usual method is by cuttings obtained by splitting up the old plants. When the bloom is over, allow the plants a season of rest. Three or four weeks will suffice for this if they are kept rather close, and by that time cuttings may be taken in plenty. These should be potted singly in the smallest thumb pots, the end of the cutting being cased entirely in silver sand, and they must be placed on a steady bottom-heat of 70° until rooted, when they must be shifted into five-inch pots, and be again put in bottom-heat for a week, after which they must be carefully inured to a cooler temperature, and be ultimately removed to a cold pit. All the forwardest, that have filled the 48-size pots with roots, may be shifted into 32-size, but it will be folly to shift any, the roots of which have not reached the sides of the pots.

To obtain extra fine specimens, select well-grown plants in flower. Remove the flowers and shake the plants out of their pots, and repot in 48-size. Then put them on bottom-heat to promote a good start in the new soil; and as soon as they have filled the pots with roots, shift into 24-size (eight-inch). If the pots are fairly drained, if the plants have no more artificial heat than is necessary, and the management otherwise is right, you will be well repaid when these large plants come into flower.

PRIMULA JAPONICA is a frame plant, reputed hardy, yet not well adapted for weathering the storm in the open border. To secure fine specimens, put them into rather large pots in a rich, light, loamy soil, and keep them in a cold frame at all seasons except when they are in flower, when they will be treasures for the conservatory. They produce plenty of seed, which should be sown as soon as gathered, and covered very lightly. The seed will probably remain dormant a long time, and there must be no haste in disturbing the soil it was sown in, for the young plants may appear in myriads in the course of six months or so. We have always succeeded in getting the seeds up in about ten days by putting the seed-pans in a heat of 75°. When grown as a border plant this primula should have a shady sheltered situation.

SCHIZOSTYLIS.—A few years ago, Messrs. Backhouse introduced to English gardens the beautiful Cape Iris, *Schizostylis coccinea*, which has the twofold merit of being perfectly hardy and of flowering in the later months of the year, when there is nothing to compete with its brilliant scarlet flowers. The best way to grow this plant is to plant it in any sunny border in spring, carefully take it up and pot it at the end of September, and place it in the greenhouse, where it will flower during October and November, and, if the clumps are large and strong, until Christmas.

SISYRINCHIUM.—A pretty Irid, almost equal to the lovely *Iris reticulata*. The most useful is the little *S. anceps*, which you can plant in patches in front of rhododendron beds, and it will grow and flower freely. *S. grandiflora* has white flowers; *S. Nuttali*, blue; and *S. striatum* yellow. They are all hardy, and will grow well in sandy peat, or mellow sandy loam in which there is much vegetable fibre. A few of the early-flowering kinds are to be valued as pot plants in the greenhouse.

STATICE.—This is an interesting genus, and in high favour with exhibitors, because they offer a few difficulties, and none but the patient and painstaking ever succeed in obtaining fine specimens. The requirements of the plants are few enough, but they will not endure any kind of neglect, or any really bad management. They have tender roots, and if kept too wet or too dry, grow smaller instead of larger; and if not soon aided by remedial measures, die outright. We will suppose you have a plant or so of each of the sorts you wish to grow, including, of course, such as *S. Holfordi*, *S. imbricata*, and *S. profusa*. The first step is to obtain a few cuttings, and preparatory thereto the plants must be persuaded to make shoots for the purpose. The best course of procedure is to place the old plants in a warm house at the beginning of March. A safe temperature is one ranging from 50° to 60°, such, for instance, as is to be met with in a peach-house or vinery at work.

These plants, if carefully watered, will soon begin to push out side-shoots. When the young shoots have about five or six leaves they can be taken off. In taking them off with a knife let it have a thoroughly keen edge. There is a certain amount of nicety necessary to be observed in this operation, for

cuttings strike quicker if taken off with a thin slice of bark—not a clumsy heel, but cut so close to the stem as to take a portion of the bark with it. There is very little fear of them damping off when this is done. It must be borne in mind, at this stage, that the cuttings are necessarily tender, and further, that they will either root quickly or die quickly. The cutting-pots should be prepared previously, to enable the cultivator to get them in as quickly as possible. The pots, after the cuttings are inserted, should be plunged in a brisk bottom-heat of not less than 75°, and kept rather close until the cuttings begin to root, when more air will be necessary. The glass of the propagating frame will require wiping occasionally, otherwise they will probably damp off.

When the cuttings are nicely rooted, prepare the soil and bring it into the propagating-house a few days beforehand, to become of the same temperature as the house in which they are growing. This is an essential point—one that cannot be very well over-estimated in dealing with young tender plants of any description. For the first potting, the soil should consist of good fibry loam and peat in equal proportions, with plenty of leaf-mould and silver-sand, to keep it light and open. Use small 60's for this potting, 48's for the next, and then 24's. Though it will not be necessary to replace the young plants in bottom-heat, it is advisable that they should remain in a nice growing temperature until they get established. They do better when kept in a warm house until they have filled the pots with roots, been repotted into the next size, and established in their new quarters. At this stage the plants should be removed into the greenhouse, and after a little nursing be placed so as to get plenty of light and air. In August, if everything goes on favourably, repot the plants into 24's, and use two parts loam, one of peat, half a part of thoroughly decomposed cow-dung, and a little leaf-mould and sand. The soil should be chopped up and well mixed together, and every particle of fibre preserved. It is necessary to exercise the utmost caution at all seasons in watering these plants. They require a plentiful supply when growing, and but little at all other times.

The proper place for statices through the summer, is undoubtedly the conservatory or greenhouse. Though they are very properly classed with greenhouse plants, it will be found that they do better in an intermediate house through

the winter, where a mean temperature of 45° is maintained. As decorative plants, they are invaluable, for they last good a long time, and are moreover particularly useful for mixing with other everlasting flowers for making up vases for winter decorations, their colours being so distinct from everything else in the same way.

STOCKS of several kinds may be turned to good account for the conservatory, their spicy odour being as welcome as their bold spikes of double flowers. To grow them well in pots is not so easy a matter as may appear to amateurs who have not made the experiment; consequently, those who are altogether inexperienced must not expect triumphant success in the first instance.

The seed should be sown in a shallow box or pan on the 1st of August, and be shut up in a frame until sprouted, after which full exposure to light and air is necessary. As soon as the plants are large enough to handle, pot them into 48-sized pots, three plants in a pot. The compost should consist of turfy loam, two parts, and good rotten manure one part. They must be potted firmly, or they will not thrive; keep them fully exposed to the weather until frost is likely, when remove them to a cold pit, and put a mat over when the weather is severe.

Early in January take the forwardest to the greenhouse and keep them near the glass. In the middle of February remove them to a temperature of 50° to 60°, syringe them daily, and keep them watered with weak liquid manure. They will flower finely, and repay you for your trouble.

Those left in the pit are to be taken to the greenhouse in February, and are to remain there until they flower, to succeed the first lot, as they will not want any more heat than they will obtain here.

It is a good plan to put out a lot of the plants from the August sowing in a bed of light rich soil in a turf pit, and in the spring lift them carefully, and plant them in a bed near the windows, to perfume the welcome breath of the early summer.

STREPTANTHERA.—This scarce Cape bulb is by some considered a gladiolus, but it is a true Irid. *S. cuprea* is the most handsome, being a rosy copper-colour with black marks in the

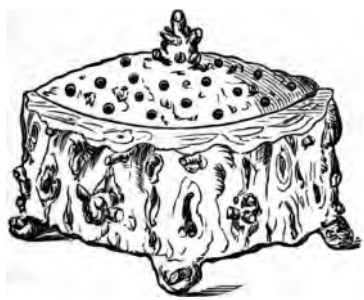
centre. *S. elegans* is white and blue, and more scarce than *S. cuprea*. These may be grown in the same way as Ixias, in a warm, sheltered border, or in pots. When grown in the greenhouse, they flower in April or May; but in the border they do not flower till June.

TRITONIA is a grand section of Irids, and some of the species much resemble Ixias. The same treatment as Ixias will suit them. *T. aurea* is the only one which it is quite safe to grow out of doors, and that must have some protection in winter. November is the proper time to pot them, in a mixture of loam, leaf-mould, and peat, with plenty of bright sand. Keep them rather dry till they begin to grow. *T. aurea* makes a fine bush-like plant if grown in a large pot. Five bulbs may be put in a pot seven inches across, and the plants will grow two feet high, and bloom superbly. The colour of the flowers is reddish-orange. The best of all for the greenhouse shelf is *T. crocata*, which can be grown five bulbs in a 6-inch pot; and most important is it that the bulbs are not disturbed or repotted more often than every four or five years, for when repotted often they do not flower well. The plants should not be tied to sticks, but be allowed to fall about in their own way; they are then very pretty with garlands of scarlet-orange flowers. *T. rosea* is a beautiful rosy flower. The best way for the amateur who loves fine flowers is to grow all the Tritonias and Ixias obtainable. He will not easily obtain too many sorts, for each will have a charm to afford him fresh delight.

TULIPS.—Treat as directed for hyacinths, but put three bulbs in a 48-size pot. The early tulips are the most useful for greenhouse culture, and the safest way to ensure a fine display is to have two sets of bulbs, so as to be enabled to plant them out alternately in October, one season's growth in the open ground in rich soil being sufficient to restore their energies for growing in pots again the following season. They increase freely by offsets, and considering their high quality, and that one purchase of roots is sufficient for a lifetime, they are the cheapest of all the early flowering bulbs in cultivation.

VIOLETS.—The *Neapolitan* and *Russian* violets are well known, yet they are not grown so extensively in small gardens

for the conservatory as they should be. The double variety of the latter is very sweet-scented, highly ornamental, and useful for bouquets. To ensure a good supply of violets it is necessary to put out strong runners as early in the season as they can be had, in a bed of rich soil. They should be planted at a distance of nine inches apart one way and twelve inches the other, and if the weather happens to be dry, water liberally three or four times in the course of the summer. Beyond watering and keeping the bed free from weeds very little attention will be required throughout the growing season. Early in October lift them carefully, and put the clumps singly in pots, or two or three together in large pans. For supplying flowers for bouquets and vases they should be planted in a bed of light rich soil made up on a heap of warm leaves in a pit. It will be advantageous if those in pots are started with the assistance of a bed of leaves only, as the heat given off by them appears to suit them better than the heat from hot-water pipes or flues.



RUSTIC JARDINET FOR CROCUSES.

CHAPTER VI.

THE CHRYSANTHEMUM.

THE chrysanthemum is usually regarded as a hardy border flower which may be left to itself to grow as a weed, or at least to have no more aid than an ugly stake to which it is roughly tied to save it from being blown into rags by the gales of autumn. But when carefully cultivated for the decoration of the conservatory it is one of the finest plants in the English garden, and may be employed in a variety of ways at a time when flowers are exceedingly scarce.

In the gloomy months of November and December, when the chrysanthemum is in its prime, gaslight entertainments begin to assume increased importance, and many of these might be considerably enriched by the aid of these noble flowers. The poinsettia and the solanum are charming things for gaslight decoration, but the chrysanthemum affords endless variety at an extravagantly cheap rate; and in a private entrance-hall, a concert-room, a bazaar, or the covered approaches to any place of public resort, a bank of chrysanthemums affords a brilliant welcome and a grand accompaniment to any kind of festivity, because every known variety appears to advantage under gaslight.

The chrysanthemum being strictly herbaceous, properly falls into this place in the order of our work, but its importance entitles it to a separate chapter, and our business will be to provide a comprehensive chapter, for we can afford but little space for a large subject.

The chrysanthemum will grow in any good garden soil, but when grown in pots should have a rich and substantial loamy compost and at every stage the pots must be well drained, for if the soil becomes pasty, the plants will make no progress. When it is intended to grow great exhibition specimens, cuttings must be started in November, but nice plants for the conservatory may be obtained from cuttings started in Feb-

ruary, March, or April. As there are many inferior sorts in cultivation it is important to make a good selection, for, between the best and the worst, the difference is as Hyperion to a Satyr. The free-flowering kinds of the most distinct and striking colours are always to be preferred. Many of the most perfect exhibition incurved flowers are not showy, and, although a connoisseur will prefer them to all others, many of the high-coloured reflexed flowers will be preferred by those who are less critical. Plenty of flowers and plenty of colour are the principal desiderata in selecting for conservatory decoration, and happily there are a few of the very finest exhibition kinds, such, for example, as Jardin des Plantes, Mrs. G. Rundle, Dr. Sharp, and the Prince of Wales, which give us an abundance of flowers, of the most attractive character. It is not important to select early-flowering kinds, because, as they will be protected, the November frosts will not affect them. To divide an old plant into a number of suckers, each with a few roots attached, or to make plants from cuttings three inches long is such a simple business that it would be waste of time to go into particulars.

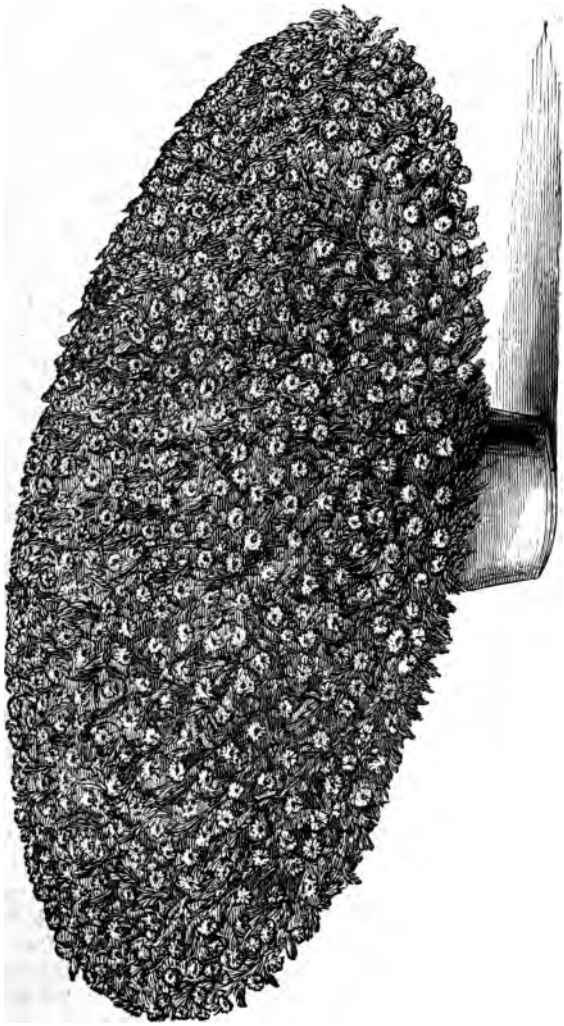
The start having been made, it will be well to bear in mind that the young plants should have as much air and light as possible while in the greenhouse, and that early in April the point of every one should be pinched out to cause the production of side branches. Soon after stopping, shift them into forty-eight size pots. About the middle of May plunge them in a bed of coal-ashes in an open spot, and let them be well taken care of as to watering. In the first week of June look over the plants, and if you are not familiar with the sorts, take a trade catalogue and look them through. When you find by the label on your plant that you have to decide as to one of the finest incurved varieties, do not stop the plant. In any case, if you find the variety is *not* recommended for specimen culture, refrain from stopping. On the other hand, those which *are* recommended for specimens may be stopped in the first week of June, as being free to flower. Incurved and late-flowering varieties should only be stopped once, and better if not stopped at all. Reflexed, free-flowering, and early-flowering kinds in all classes may be stopped twice, and the smaller sorts, such as Intermediates and Pompons, may be stopped three times, and the last pinching should be done in the early part of June or by the middle of June at latest.

In the middle of June the plants should be shifted into eight-inch pots, to give them a good chance in the height of the growing season. Keep them freely watered even in rainy weather, for it often happens that, while the leaves are well washed by rain, the roots get none of it. In dry weather syringe them once a day at least, in very hot weather twice, morning and evening being the best times.

By the middle of July the first-class show kinds will be the better for a shift into eleven-inch pots if large specimens are required, but the reflexed and smaller kinds may be allowed to flower in eight-inch pots, and be helped to the end of their journey by liquid manure as soon as they have quite filled their pots with roots. In any case, however, robust plants that have quite filled their pots with roots, and that appear, by their ample leafage aud walking-stick stems, to be capable of growing considerably larger yet, should be shifted to give them a chance of making a grand show when their day of triumph arrives. But there must be no disturbance of the roots after the middle of July or there will be very few flowers in November. And however strong the plants or propitious the season, eleven-pots are the largest allowable for chrysanthemums. If you put them into larger pots you may whistle for flowers.

The chrysanthemum is grown in a variety of forms according to the fancy of the cultivator. The tall untrained bushes suitable for the conservatory are the easiest to manage; and any one who has the least idea of gardening operations can stake and train them, for all they need is sufficient support to enable them to carry their flowers. But it is another matter when specimens such as here figured are required. To produce any of these forms it is necessary to take cuttings in November, and keep the young plants in the greenhouse through the winter.

CONVEX SPECIMENS are the most telling of all for exhibition purposes. The large flowering kinds and the pompons are equally adapted for this mode of management. The plants raised from November cuttings must be stopped about the middle of March. In the first week of April they should be shifted into six-inch pots. It is usual to grow all kinds of chrysanthemums in the same mixture; but, when perfection is aimed at, the large kinds will do better in a somewhat heavier soil than the



SPECIMEN CONVEX POMPON.

pompons. These latter will thrive in a mixture of equal parts of good turfy loam and well-rotted hotbed manure, and about a sixth part of the whole bulk of sharp sand and pounded oyster-shells. Keep them in a cold frame with plenty of air and light, and stop and tie out loosely as the growth progresses, endeavouring to obtain an abundance of side-shoots to form the foundation of a large plant. Shift into the blooming pots about the middle or end of June. The proper size of pot for an exhibition pompon is eight-inch, for the large varieties eleven-inch. About the 10th of July stop them all over for the last time, and prepare for training. The basis of the training should be a ring of No. 3 iron wire level with the rim of the pot, with four cross pieces to preserve its shape, and stout pegs to keep it firmly in its place. An immense amount of training may be done with a very small proportion of sticks or wires, and the cultivator will find that by patiently tying down the shoots with loops of good bast, so as to lay out the branches in the fashion of a spider's web, he will in the end obtain a very compact and handsome head of leaf and bloom. The proper time to begin the final training is about the 10th of September, when the growth will be completed and the points will be knotting for bloom. The plants should never suffer a check, and should be liberally supplied with water at the roots in the growing season, and frequently refreshed by means of the syringe overhead. The pots should be plunged in an open sunny border from the middle of May until the first or second week in October, when they must be transferred to the pit or cool house to flower. From the time the final training begins until the flowers are opening freely they should have the aid of weak liquid manure. If the weather is mild and sunny, they will not need the help of fire heat when housed, but if cold rains or frost should occur, keep the fire going to assist the bloom. The temperature of the house must be kept as nearly as possible at fifty to sixty degrees during the day, and forty by night.

From the time the flower buds are visible the process of thinning them must commence. In disbudding the large varieties remove from every cluster of buds all except the top bud. In disbudding pompons, leave the top bud on every shoot, and two or three buds of the same cluster. If you allow all the buds to remain, the appearance of the plant will



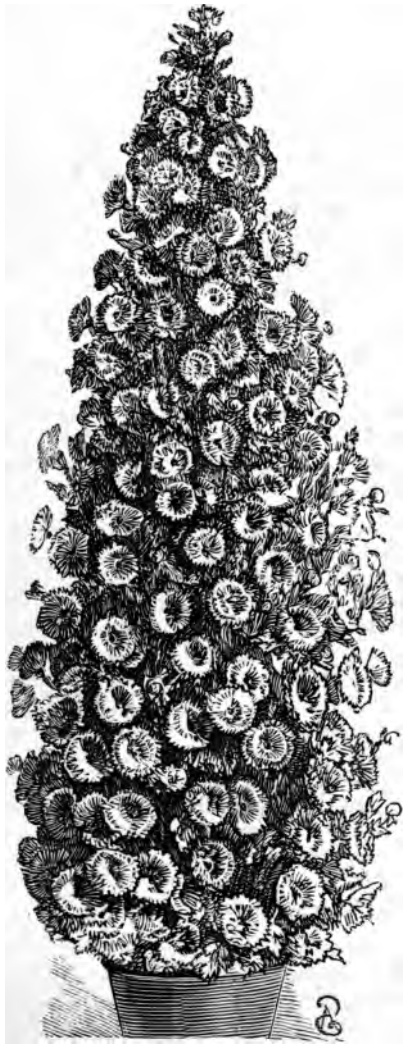
SPÉCIMEN STANDARD POMPON.

be spoiled, for the flowers will be small and crowded and will compress each other out of form.

STANDARDS may be produced by proper management of any of the varieties, but the pompons and intermediates make the best standards. As regards the potting and watering and other routine matters, follow the instructions already given. The special points alone concern us now. Select for standards the strongest plants of suitable varieties, and in the month of March shift them into forty-eight size. Keep the plant straight by means of a light stake and be sure *not* to pinch the point out. As side shoots appear pinch them back slightly so as to leave one or two leaves to clothe the stem. When the stem is as tall as you wish pinch out the point, and carefully but loosely tie out the side shoots as they appear to form the head of the plant. When the shoots are four to six inches long stop them, and tie with care the secondary shoots that follow. You may go on stopping until the first week in July, and then stop for the last time. Finish the training by the first week in September and house the plants rather early.

PYRAMIDS.—For this form pompons and intermediates are best adapted. Select strong autumn cuttings and give them the regular shifts and routine management as directed above. In the training the matter of first importance is to preserve the leader and all the side branches. About the end of May stop all the shoots from top to bottom, stop them all again in the middle of June, unless it be to restrain some shoots that will grow out of bounds. To secure a rich effect the utmost should be made of every shoot, and the final training should be done at the end of August, to allow time for the growth that follows to push beyond the sticks, and produce the happy effect of a perfect plant. In some cases the uppermost shoots will require to be trained downwards, and others must be taken round the sticks which form the outside framework, in preference to stopping them, and if all this is done in good time not a stick or tie will be visible when the plant is in flower.

BUSH POMPONS of a somewhat rough but most effective character may be grown in quantity by an extremely simple method. Plant out well-rooted cuttings in very poor soil in a sunny situation eighteen inches apart every way. Give them water if they want it, but the less water they have the better.



SPECIMEN PYRAMID POMPON.

About the middle of June stop them all over. At the end of September put them in 48's and shut them up in a close warm house and keep them well syringed. After a week of this treatment give them air by degrees, and as they come into flower take them to the conservatory. They ought to be compact, round-headed bushes, completely covered with flowers.

The only insect that seriously injures the chrysanthemum is the celery fly (*Tephritis onopordinis*). The maggot of this fly burrows within the leaf of the plant and causes, first, a pellucid pellicle, and subsequently the death of the leaf. The cultivator must occasionally make search for the maggot and destroy it by pressing the pellicle between finger and thumb. To remove it from the leaf is impossible, as it occupies the substance between the upper and under surfaces.

CHAPTER VII.

SOFT-WOODED GREENHOUSE PLANTS.

BETWEEN herbaceous and soft-wooded plants the difference is sufficiently decisive, but as to cultivation, they require pretty nearly the same conditions, and may, therefore, be associated in the same house. We shall in this chapter offer brief directions for the cultivation of soft-wooded plants, but reserve for separate chapters the pelargonium and the fuchsia, on account of their great importance. The whole of the plants now before us may be raised from seeds or cuttings, and, as a rule, the latter are to be preferred. If one or two hard-wooded plants should find their way into this list it will be because they associate better with the softer section than with that to which a technical classification would assign them.

BOUVARDIA.—These are hard-wooded plants, but associate best with soft-wooded plants, and should only be grown in a house that is kept well heated during winter. Those employed for bedding purposes make nice pot plants, but the best of the family is *B. longiflora*, which produces a profusion of most elegant and sweet-scented white flowers during the winter. It is a troublesome plant, but worth any amount of trouble. Strike cuttings of the young wood in a brisk moist heat in March. Pot off as soon as rooted in five-inch pots, in a mixture of equal parts loam and peat, and a sixth part of the whole bulk of silver sand. Put them into the warmest place you have, but they must not be closely shut up, and the foliage must be frequently syringed. A fortnight after this potting pinch out the points of all the shoots to promote a bushy habit. Winter them in a temperature of 50°, and in February shift them into eight-inch pots, and after this potting put them in a good



BOUVARDIA LONGIFLORA.

growing temperature, and as the season advances move them to cooler quarters, so that by the middle of August they may be in a light airy house, to ripen the wood and prepare them for flowering. As soon as flowers appear put them into a temperature of 60°, keep them very clean, and they will continue to flower for four or five months.

The bedding varieties of bouvardia are more hardy than the lovely longiflora, and may be prepared for the embellishment of the conservatory by a very simple course of culture. In the middle of May secure a sufficient number of plants of the sorts required. Newly-made plants from spring cuttings will not do, but old scrubby ugly ones will answer perfectly. Cut them rather close, so that when they make new shoots they will become neat round bushes, and plant them out in a sunny spot. Give water as required. In the first or second week of July pinch out the points of all shoots, and give no more water. About the middle of September take them up carefully, and pot them in a light loamy mixture, taking care to injure the roots as little as possible. Give them a good watering, and then put them near a wall out of doors where the sun will not shine on them, and keep them regularly sprinkled and watered. In the early part of October take them into the greenhouse, and very soon they will begin to flower and make a splendid show. *B. Vreelanda*, which is a capital bedding plant, is also one of the best for this rough-and-ready course of culture for the production of winter flowers.

Bouvardias may be easily multiplied by root-cuttings, and those intended for flowering in summer may be wintered in a temperature of 40° to 50°.

Cytisus. — The pretty greenhouse brooms are so easy to manage that we may dispose of them in a few words. They may be raised from seed without difficulty, but it requires some experience to raise them from cuttings. The best soil for them is a mixture of peat and loam, with a sixth part sand. Though almost hardy, they like warmth and a moist atmosphere when growing. When they become fair-sized trees they will bear rough treatment without harm, and may be wintered in a cool house, provided they are never touched by frost. When they are large enough to be in eight-inch pots they may remain in the same pots for several years if assisted with weak manure water in the early summer when making their

new growth. If required to flower in winter treat as recommended for bouvardias.

CHEIRANTHUS.—The Double Wallflowers are to be valued for the conservatory, and they may, in the course of years, be grown to a large size in the form of noble trees. For all ordinary purposes two-year old plants are the most suitable. The cuttings are struck under a hand-glass as soon as they can be had, and when nicely rooted are planted out at a distance of nine inches apart, in rows about fifteen inches from each other. The young shoots are stopped two or three times, and in September they are taken up and planted a little further apart each way. This serves the double purpose of checking the growth and rendering them better able to withstand the effects of a severe winter, and also promotes the formation of a mass of fibrous roots. They are not allowed to flower the following spring, and the young shoots are stopped all over the plants three or four times during the early part of the summer, but no stopping is done after the end of June, as the remaining part of the summer is necessary to ensure the thorough maturation of the young growth. By the middle of September they should be taken up and put in eight-inch pots. Small plants are of no use in the conservatory, for if they are not large enough to produce solid heads of bloom two feet across they are anything but effective. The double yellow and red, known respectively as *C. luteus fl.-pl.* and *C. purpureus fl.-pl.*, are the only kinds suitable.

CALCEOLARIA.—Of this well-known genus there are two distinct sections, known as the "herbaceous" and the "shrubby." The first is the most important section, because only fit for pot culture, and when well done presenting a wonderful show of colour with endless variety of beauty. They require peculiar management, and those cultivators will alone succeed who earnestly give their minds to the business. Nevertheless, they are very easy to manage, and those who will follow our directions will surely succeed. It is best to begin with seed, and to sow it, as soon as ripe, in pans filled with light loamy compost, and then place the pans on a moderate hotbed or shut them up in a propagating house, or put them in a close corner of the greenhouse and cover with a bell-glass. They must be kept constantly moist, and as soon as the plants

are fairly up they must be carefully pricked out into boxes or pans, and when they have grown a little be potted separately in sixties. From first to last, after they leave the seed pans, they should be grown in turfy loam, with about a fourth of rotten hotbed manure added. There is nothing better for them than loam from the stack, as described in Chapter IV. It should be well chopped up, but should be rather lumpy. Keep them close after potting, but give them air as soon as they have begun to grow again, and as soon as they have filled the 60-size pots with roots shift them into five-inch pots. They must be wintered in a greenhouse, very near the glass, and be very cautiously watered, until the days begin to lengthen rapidly. Beware of the sudden bursts of sunshine that occur in the spring and shade them slightly, or they will suffer, and beware, also, of using any more fire heat than is necessary to protect them from frost.

If the plants are strong shift them into eight-inch pots in February, and be especially careful in watering for a few weeks afterwards. As the flower-stalks make their appearance support them with neat sticks. Plants intended for large specimens for the following year should have their flowers removed immediately the size, shape, and colour of them can be seen, be kept cool all the summer, and shifted into larger pots in autumn, early enough to fill the pots with roots before winter. More care in watering is necessary the second winter than the first. These will probably require tying out before the flowers make their appearance. It must be done with care, for the side shoots easily snap off, and then the shape of the plant is completely spoilt.

When grown from cuttings the treatment is the same as seedlings after the cuttings are rooted. They are easily struck in a cold frame if taken off as soon as they are large enough, and kept close and shady. The cuttings should, of course, be taken from the very best varieties and from plants which have not been allowed to ripen seed. Shade when the plants are in bloom; and, lastly, on the first sign of there being a single green-fly on them give the house or pit a thorough smoking with good tobacco paper. On no account let the green-fly or red-spider get ahead, for they soon ruin the plants, and it is an extremely difficult matter to destroy them; for they shelter themselves underneath the leaves.

The "shrubby" section is chiefly valued for bedding pur-

poses, but they also make showy pot plants. Those of them that are of a slightly herbaceous character are to be preferred, and the best mode of procedure is to select in early spring some of the most thrifty from a batch of plants raised from autumn cuttings, and pot them on and keep them in a damp pit very close to the glass. They may be flowered well in 48 size, or they may be grown on, and the flowers suppressed the first season to make great plants of them to flower the second year.

DEUTZIA.—There are several of this genus in cultivation, but the favorite *D. gracilis* is the only one worth growing in the greenhouse. As it is quite hardy in the south of England, it needs no heat to keep it in winter. The most ordinary care suffices to ensure an annual display of its elegant white flowers, but if they are wanted early the plant must have a little extra attention. We will suppose you want to secure a good display of deutzias early in the spring. You must begin in the first week of May by planting out a lot of one-year old plants in poor soil, in an open sunny situation, and keep them well watered until the end of June, after which time do not give them a drop. In September take them up and put them in as small pots as their roots can be crammed into without any serious injury, and prune them into shape. It is a very easy matter to prune all the flowers out of them: therefore, by the term "pruning" is to be understood the shortening of any extra long shoots that spoil the contour of the plants. Put them in a cold pit and give them a good watering. In November take them to the greenhouse and keep them cool. In the course of a fortnight put them into the warmest part of the house, and in a week afterwards provide for them, if possible, a snug quarter where the temperature averages 60° to 70°. If this cannot be done, be content with the bloom a little later than a forcing heat would give, and as they are sure to flower without any forcing at all, the most humble appliances are sufficient for rendering perfect justice to the plant.

To raise stock, make cuttings of the young shoots when they are three inches long and growing nicely. Take them off in two-inch lengths and insert in sand, and give them the aid of a steady bottom-heat. A light loamy compost is to be preferred, but the plant will grow in any soil that is neither sour nor pasty. When they acquire some size they may be kept

several years in the same pots, and if desirable large plants may be divided by cutting through the roots. In such a case it is best to cut them into suitable sizes in September and pot them in very small pots, and winter them in a cool house or pit as dry as possible. In May plant them out in poor soil, and in September following they will be nice plants to pot up for the benefit of the greenhouse.

HELIOTROPE.—This deliciously odorous flower may be grown by the merest tyro, but it is well to remember that it is the most susceptible to frost of any plant of its class. A geranium or verbena may be frozen several times in the winter, say to the extent of five or six degrees of frost, but such a freezing would kill every heliotrope to the roots. If grown as a pot plant, treat it precisely the same as recommended for the verbena and petunia. It is particularly worthy of observation that it makes a fine wall or trellis plant in a warm conservatory, and, if planted out in a border of light rich soil, will produce flowers all the year round. Even in a cool conservatory it may be planted out to clothe a pillar or trellis, but, of course, it will not flower in winter.

HYDRANGEA.—For the conservatory and to keep company with the agapanthus in the entrance court, and to fill up amongst groups of pot plants near a summer-house or fountain, the hydrangea is one of the best plants in our gardens. There are several distinct species in cultivation, but the best is our old friend *H. hortensis*, which produces pink flowers when grown in rich loam, and blue flowers when grown in either peat or loam in which there is a decided trace of the salts of iron. We have employed hydrangeas largely for our plunging system, and have been compelled of course to hit the shortest and surest way of ensuring large heads of flowers with the least possible trouble. In May a number of cuttings are taken from the lower parts of the stems of strong plants. We prefer young shoots with four or five joints, not more than five, and perhaps preferable with only three. The strongest wood may be used, and will be sure to root, but small young cuttings make the best plants. The cuttings have the two lowest leaves removed, and are potted singly in thumb pots in a mixture of leaf-mould and peat, with a very little sand. These are all placed on a moist bottom-heat of not more than 60°, either

over a propagating tank, or a frame over a dung-bed. They require to be kept moderately moist, and will bear to be closely confined until they form roots. Never having seen a case of damping-off, though we have struck thousands of cuttings, and in various ways, it does not seem needful to warn the cultivator on this head. However, let air be given moderately after the lapse of a week, and thenceforward increase the supply, so that by the time the pots are filled with roots, the plants will be hard and thrifty. When propagated on a large scale they may be dibbled into wet sand, placed over a tank or dung-bed, but we prefer to pot them singly at first, as it is a decided gain in the end. When the thumbpots are full of roots shift to 60-sized pots, using a compost of peat, leaf, and loam from rotted turfs, equal parts of each, keep them in the greenhouse, or warm pit, water frequently overhead, and at the root; give plenty of air, and keep the plants near the glass. When these pots are full of roots, shift into 6-inch pots, the compost to be strong turfy loam, full of fibre; turfy peat, rotten manure and leaf-mould, equal parts, no sand. For the drainage of these pots we use only one large oyster shell, placed over the hole in the pot, hollow side downwards. The plants are shifted into these pots without breaking the balls of earth formed in the 60's, and are at once placed on a bed of coal ashes, or a hard pavement in a shady place out of doors, or plunged to the rim in a bed of cocoa-nut refuse. They have abundance of water, and before the end of October they have attained to an immense size, and have ripened plenty of hard flowering wood for the next season.

The plants are housed at the end of October. A cold pit suffices for their protection, and they have a little water occasionally; and are kept clean as they lose their leaves. In case of severe weather a little care must be taken to prevent them being severely frosted.

From this point the cultivator may proceed either to force a few at a time, or allow them to bloom naturally as the season advances. The first thing to do is to cut them back to about six eyes from the bottom of each well-placed ripe shoot, removing any weak inside shoots that might crowd the head without improving the plant. Next give them a shift to pots seven and a half inches in diameter, with the same soil as the last, and with a mulch of rotten manure an inch thick on the top. Ordinary greenhouse temperature will set them going

very early in spring, and the blooms will show immediately. Provide some neat green stakes, slender but strong, eighteen inches in length, and tie every shoot, as soon as the bloom is visible, loosely to a stake, as, when the flowers are fully expanded, their weight when wet with a shower will sometimes cause them to fall over and break the stems. All they need after this is *abundance of water*. They can scarcely have too much at the root, or be too often sprinkled overhead. When the roots begin to run upon the surface, assist them with liquid manure, rather strong, once a week, and by this time the blossoms will be expanding and colouring, and, after acquiring their proper character, will continue in perfection a longer period than those of any other plant in our gardens.

These plants are not to be shifted again till the next spring; then they are to be cut back to about eight buds from the base, and shifted into 10-inch pots, and they will make enormous specimens. The next year they may be shifted to 15-inch pots, and after that it is not advisable to increase their bulk any further. A few cuttings to furnish small useful plants should be put in every year in April or May; or if there is no convenience to strike by bottom-heat, they may be rooted under bell-glasses without heat in June, but it is best to strike them not later than the first week in May to insure the formation of ripe wood for blooming the next year. For ordinary purposes the most useful are yearling plants, which, when they have bloomed once, are to be destroyed. To force them is a mere matter of temperature, and they take a moist heat from Christmas onwards as kindly as any greenhouse plants in the catalogue.

LANTANA. — The Lantana is comparatively useless as a greenhouse plant, but we must not pass it by. The stove is its proper house as a pot plant, but the experienced cultivator will turn it to good account, if so minded, without the aid of a stove. In a general way the same cultivation as the verbena requires will suit them, and it is worthy of note that they flower more freely the second year than the first. In any case they like warmth and a humid atmosphere. Well-grown specimens covered with flowers are worthy of a place in any group of ornamental plants, but the odour of the flowers is so unpleasant that they are comparatively useless for making a bouquet.

LIBONIA.—The beautiful *L. floribunda* is valued for its winter flowers, which may be likened to those of *Cuphea platycentra*. It can only be turned to account, however, where there is convenience for keeping it warm in the winter, and those who have only a cool house may as well do without it, for it will simply worry them. It is very easy to propagate and grow. Cuttings of the young wood should be inserted early in the spring, and treated in the same way as the ordinary kinds of soft-wooded plants, the pot being plunged in a nice bottom-heat. The plant being very compact and short-jointed, does not need after it is potted to be frequently stopped; the great thing is to get the lower part of the plant well furnished with branches in its first growth. It is in the earlier stages only that the stopping of shoots is essential. It will thrive in good rich loamy soil, and may stand out of doors with the majority of greenhouse plants during the summer months. In common with many other winter flowering plants the Libonia loses its leaves if kept too cold in October and November. The leaves may not fall at the time, but afterwards, when the plant is in flower, it will be found that many of the leaves are dead. Excess of damp or too low a temperature in winter will very much mar the beauty of this useful plant.

PETUNIA.—For summer flowers the Petunia is invaluable, as it will flower freely if badly treated, but if skilfully handled may be developed into a sumptuous specimen-plant. The single and double varieties have equal claims on our attention, but the last named are the most popular, the flowers being perfect rosettes, rich and various in colour, and deliciously scented. For hanging-baskets and vases the single varieties are to be preferred, and for exhibition purposes the double varieties are certainly the best, especially when trained to a neat pyramidal outline, dense, dwarf, leafy to the bottom and richly covered with their lovely flowers.

Petunias may be handled in the same way as fuchsias; they must have a generous soil, a kindly temperature during their earlier stages, and at all times the foliage must be kept perfectly clean. To get up a stock of fine specimens place a few old plants in a temperature of 60° in February, and as soon as the young shoots are sufficiently advanced, take them off, and strike in the usual way. If old plants are not at command the cuttings in the store pots may be put in warmth, and when

they start into growth, the young tops will afford a plentiful supply of cuttings. Put the cutting pots wherever they will have a temperature of 60° or 70°, and as soon as rooted put them into small 60's, from thence into five-inch pots, and finally into their blooming pots, which may be either six-, eight-, or nine-inch pots; those in eight-inch pots will generally be the most useful for conservatory decoration. When potted into the small 60's, replace in the propagating frame for a week or ten days, and then remove to a warm frame. Harden off as quickly as possible, and remove to a cold frame, as a continuance in artificial heat will result in general ruin.

Keep them close to the glass, and as soon as the season is sufficiently advanced expose the plants to a free circulation of air, to keep the growth dwarf and stocky. After the middle of May, the lights may be drawn off altogether during the day, whenever the weather is sufficiently favorable, unless the plants are required to be in flower on an early date. The stock intended for affording a late display should, after the end of May, be removed to a bed of ashes at the foot of a north wall, and receive the same attention as if sheltered with glass. It is well to remember that plants growing in pots in the open air require quite as frequent refreshings from the watering-can as others grown indoors. Never let the soil get dry enough to allow the leaves to flag; and, on the other hand, avoid too frequent applications of water. Clear soft water will suffice until the plants have had their last shift, and get pot-bound, then water with weak liquid manure, and continue its use during the whole time they are in the conservatory.

A judicious system of stopping and training must be carried out. Commence by nipping out the growing points of the young plants directly they are established in the small 60's; and after they are shifted into the five-inch pots, pinch back the side-shoots to within four or five joints of the main stem. After they are stopped, tie them out regularly, and immediately on their recovery from the effects of the final shift, pinch back to the same distance as advised for the last set of shoots. Then no more stopping, but the new growth must be trained in the usual way.

If the system of culture here advised is carried out, and the foliage kept clean by means of a sprinkle overhead once or twice a day according to the weather, there will not be much trouble from insects of any kind; but if green-fly should

happen to make its appearance, fumigate *at once*. When they are allowed to get ahead before remedial measures are brought into requisition, it requires double the quantity of tobacco to dislodge the enemies, apart from the injuries they commit. Leave green-fly alone and you may say "we part for ever" to petunias.

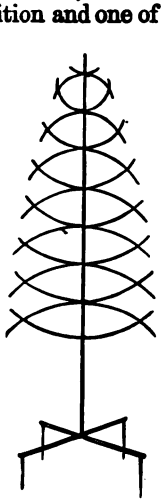
SALVIA.—The best of the Salvias are stove plants, but there are a few fine species well adapted for greenhouse culture, and of these *S. splendens* is the best. Treat as advised for Bouvardias, remembering that they love light and warmth, and, therefore, when taken to the conservatory in the autumn must have good places. It is far better to plant them out every year in May and pot them in September than to grow them always in pots. A rich, sandy, loamy soil will suit all the Salvias, and they will also thrive in peat.

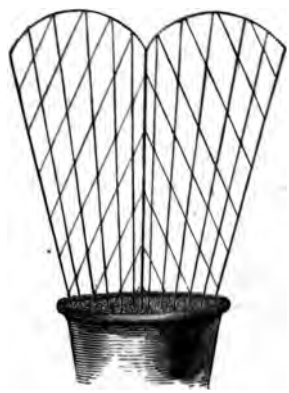
SOLANUM.—The cultivation of the scarlet-berried Solanums is so exceedingly simple that any one with ordinary appliances and ordinary skill may have a grand display of them in the autumn in the conservatory. There are several species and varieties which produce red berries; the one commonly grown hitherto has been *S. capsicastrum;* but far better, because it makes a bolder bush and bears larger berries, is *Williams's Hybridum compactum*. To get up a stock of this proceed as follows:—Place an old plant in a warm house and frequently syringe it. When the young shoots are two inches in length, take them off and dib them into sand in a heat of 60° to 70°. When rooted, pot them in a light sandy compost, and give them a moderate heat until they begin to grow; or sow the seeds in light soil, and place in a steady heat. The latter part of the month of March is the proper time to begin with either seeds or cuttings. From the time they are rooted gradually inure them to ordinary greenhouse temperature and to fresh air, so as by degrees to have them quite hardy by the middle of May. Then plant them out in a piece of rich light soil, in the full sun, fifteen inches apart; give plenty of water all the summer, and slightly train them out, so as to form open heads. They will require to be twice stopped by nipping off the points of all the shoots in the first and last week of June, and after that must grow as they please. About the middle *of September* take them up very carefully and pot them. In

this process the roots must be preserved from injury, and as much earth kept about them as possible. When potted, stake them out neatly; shade for a week, and after that keep them in the sunniest part of the greenhouse. If you follow this prescription, their appearance in November will be that of neat shrubs, two feet high and eighteen inches through, completely smothered with bright scarlet berries, full double the size of holly-berries.

TROPÆOLUM.—The showy plants of this family are better known as bedding than as pot plants and it is much to be regretted that they have declined in popularity as subjects adapted for the production of an abundance of gay flowers in the depths of winter. They are easy plants to manage whether in winter or summer, but being very soft in texture will not endure the slightest touch of frost. They all flower fairly in a temperature of 50°.

The most valuable plant of this genus is the old and famous *T. tricolorum*, a tuberous rooted species, admirably adapted for exhibition and one of the most perfect of ladies' plants, because





to train it nicely is an agreeable task for delicate fingers. To make a fine specimen the tubers should be taken out of the old soil some time during July and be re-potted. The roots are

delicate, and a light compost should be employed; one consisting of equal parts, fibrous loam, turfy peat, and leaf-mould, and a moderate quantity of silver sand will suit them admirably. The pots must be clean and well drained, and the tubers buried about two inches below the surface. The size of the pot must be regulated by the number of the tubers put in each; one should be put in five-inch, two in six-inch, three in eight-inch, and four in nine-inch pots, and the last mentioned is the largest size that should be employed. The soil must be kept dry until they start into growth, and then sufficient water applied to make the soil just moist, and no more; for very little water will be required until they have made considerable progress. After February, when the trellis is covered with foliage, more liberal supplies must be given, and an occasional dose of weak liquid manure will be of considerable service.

The trellis should be fixed in the pots when the tubers are newly potted, but if there are any reasons for not doing so, they must be fixed in their proper position before the young growth has attained a considerable length; otherwise there is a great danger of its becoming entangled, and probably it will be seriously injured.



The form of the trellis must be left to the taste of each cultivator, and it is of little consequence in which way the growth is trained, provided that it is nicely regulated, and not allowed to run together in an inextricable mass. The subjoined figures will explain themselves. A balloon is, perhaps, the most desirable; and when covered with the cheerful green foliage, and dotted with the scarlet and yellow flowers, the effect is most satisfactory. Flat trellises are very well in their way, and are the most suitable for windows or other positions where

there would not be room for a balloon. Small feathery sticks, like the tops of pea sticks, about eighteen inches in length, may be employed instead of wire trainers.

The fibrous-rooted garden varieties represented by *T. Lobbianum* are invaluable for supplying winter flowers. To have them in full bloom throughout the winter, it is necessary that the plants should be well established previous to the end of the autumn, and also that an intermediate house be available for them. Specimens intended for furnishing cut flowers should be trained within about six inches of the glass, to expose the growth to the light as much as possible. Those intended for the conservatory and other purposes, must be trained to trellises or stakes fixed in the pots, and so long as they make new growth they will continue in bloom. Where the temperature of the conservatory is maintained at or about fifty degrees during the winter, a few permanent specimens may be grown in it, and trained up the pillars and rafters, where they will be fully exposed to the light.

The cuttings should be struck in July in the stove or the cucumber house, and potted off as soon as possible after they are rooted. Short-jointed side-shoots should be selected for cuttings. A considerable saving of time will be effected if the cuttings are inserted singly in small pots, as they can then be shifted on without suffering any check. When it is desired to have specimens of extra size for the purpose of obtaining a very large supply of cut flowers, it will be an advantage to commence with plants well established in three or five inch pots, and then remove all the flowers until a few weeks before they are required, so that the energies of the plants shall not be unnecessarily taxed.

Tropæolums do not require so much pot-room in proportion to their size as many other plants, and therefore it is necessary to guard against over-potting them. Specimens trained as pyramids or standards should be put in six- or eight-inch pots, and those intended for training to pillars or rafters in either nine- or ten-inch pots. They bloom more profusely when rather confined at the roots, and exhaustion can be easily prevented by watering them with weak liquid manure.

VERONICA.—The shrubby Veronicas are much to be desired for conservatory decoration, for they are easy to grow and keep, and eminently effective. With proper management, they

flower profusely throughout September, October, and November, and are, therefore, very valuable, for they assist in bridging over the period between the time of the summer flowers going out of bloom until the chrysanthemums are at their best. There are now a considerable number of varieties in cultivation, all more or less good.

When a stock is once obtained, there will be no difficulty in keeping it up, as cuttings of the half-ripened wood will strike freely, if placed in a shady part of the greenhouse, or in the propagating pit. The wood is generally in condition for propagating purposes in May, and cuttings struck at that period will make nice little plants, and produce a few spikes of bloom in the autumn; but, with good management, they will become large specimens, not less than two feet through by the autumn following. Instead of keeping them in pots all the year round, which entails an immense amount of labour during the summer season in keeping them properly supplied with water, plant them out in the second and subsequent seasons in the open border, and they will almost take care of themselves. The way to proceed is to cut them back early in March, and to let them make new growth near the glass, to insure its being firm and strong-jointed, and then by the end of May turn them out of the pots, loosen a few of the roots round the outside, and put them out in the border. The soil should be light and rich, to insure a vigorous growth, and, at the same time, promote the formation of an abundance of fibrous roots. The distance at which they are put apart must be determined by their size, Small plants, with but one or two leading branches, may be stopped twice, but large specimens should not be stopped more than once, and in either case none of the shoots must be pinched back after the first week in July. Early in September take them up carefully, with as much soil as possible adhering to the roots, and put them into the smallest sized pots practicable. Bushy specimens, from eighteen to thirty inches in diameter, will be the most suitable size for the conservatory, but if they are required larger, they can be easily produced by planting them out annually.

VERBENA.—The directions given for the cultivation of the petunia might be referred to for the saving of space under this head, but we could not hope to satisfy the reader by disposing of the Verbena in so curt a manner. Verbenas are

pretty when grown in pots under glass, but for conservatory decoration are less useful than petunias.

For the purpose of laying a good foundation, in the month of March, take the tops off the healthiest autumn-struck plants, and strike them in a good bottom-heat. They will begin to grow freely as soon as furnished with roots, and this will be the best indication the cultivator could have of their being ready for potting off. Prepare a compost by mixing together two parts of turfy loam and a part each of leaf-mould and old hotbed manure, and about a sixth part of sand. Put the compost in the house a day or two before required for use, and then put them singly in three-inch pots. They should remain a few days in the propagating pit after they are potted off, and then be removed to an intermediate house, where they can be kept rather close until the roots become established in the new soil. They must not be coddled, but it would check the growth too much to take them to the greenhouse, where they would be fully exposed to a free circulation of air. If there is no choice about taking them direct to the greenhouse, then place them in the warmest corner, and keep the ventilators near them closed for a few days.

When they are established in the small pots nip out the growing points, to cause them to produce side-shoots, and when the latter are about two inches in length, stop them by nipping out the points. They will probably require to be shifted into larger pots before they are stopped a second time, but very often it is better not to repot until afterwards. It is a golden rule to shift when the pots are well filled with roots, but before they become potbound. Specimens in six-inch pots will be quite large enough for ordinary decorative purposes; but if they are required extra large shift them into eight- or nine-inch pots as soon as they are well established.

Training must be proceeded with after the second stopping, and the simplest form possible should be adopted. All balloon or other wire trellises should be avoided, and a few neat stakes only be employed. From the time they are established in the small pots until they begin to bloom, a cold frame or greenhouse, where they can be placed near the glass, and enjoy a fresh circulation of air, will be the best position. Water liberally, and after the pots in which they are to bloom are well filled with roots, use rather weak liquid manure alternately with soft, pure water. Syringe them overhead occasion-

ally, and keep a sharp look-out for green-fly, which, if the plants are allowed to suffer from the want of water, or kept in a close stifling atmosphere, will soon become troublesome. Tobacco smoke is one of the very best remedies, but some degree of caution is necessary, because the tender foliage is very susceptible of injury.

VIOLA.—The greenhouse culture of Violets is extremely simple, but it is just as easy to fail as to succeed. The best mode of obtaining a supply of such hardy kinds as the *Russian* and *Neapolitan* is to lift the plants in October, and plant them in turf pits or in frames on a gentle hotbed of leaves. The lights should not be put on until there is apprehension of frost, and they must be kept regularly watered and have air at all favorable opportunities. A plantation for the purpose should be made every year, in April, by putting out young rooted runners in beds of rich sandy loam, with which plenty of charrings from the smother heap have been mixed. The greenhouse species, such as *V. arborea* (the Tree Violet), and *V. hederacea* (the Ivy-leaved Violet), should be grown in rich sandy soil, and, after flowering, should be put out of doors, in a shady place, until the end of September. The double varieties of the Russian, such as *The Czar*, *The Queen*, and others, make beautiful pot-plants for the conservatory if planted out in April and potted up in *September*, in the same way that bedding plants are treated.



TREE VIOLET.

CHAPTER VIII.

THE PELARGONIUM OR GERANIUM.

In making choice of a name for any of our friends that we have been accustomed to speak of as geraniums take care to look about you. If there are any botanists within hearing, say "pelargonium," and take all the consequences. But if none of those exacting and fastidious gentry are in the field, speak of the plants as "geraniums," and you will have the good fortune to be understood by the entire audience without a single exception. Botanists apply the term pelargonium to that section of the great family of cranes'-bills which have irregular or unsymmetrical corollas; those that have regular corollas being by them called geraniums. Thus, all our exhibition and bedding plants that are commonly known as geraniums, are classed by botanists as *Pelargoniums* because the top petals are larger than the others, and the flowers are, therefore, irregular or unsymmetrical.

The pelargoniums may be divided into two great sections. The first of these have leaves wrinkled and notched, and large flowers which are sometimes brilliantly self-coloured and in other cases are blotched or striped, or delicately edged with colour. These used to be called "pelargoniums" by the florist, and the term was a convenient one to distinguish them from those of the second section. These have leaves less wrinkled than those of the first section, and a considerable number have leaves that are nearly smooth and more or less round and flat, and a very large proportion have the leaves marked with a black or brown or red "zone." These are the "horseshoe geraniums" of days gone by, the "zonals" of modern garden phraseology, and the "geraniums" of all mankind save and except the botanists. Each of these sections may be again subdivided. In the first we shall find "show," "fancy," "spotted," and "forcing" *pelargoniums*. In the second we shall find "scarlet," "nosegay," "tricolor," and "variegated" *geraniums*. It is fortunate for the writer that the reader will

not need elaborate explanations, for to classify and define at length the whole of the garden pelargoniums would consume time and space that both writer and reader would prefer to occupy with matters of a more strictly practical nature.

As to pelargoniums in general, it must be observed that their popularity is due alike to their brilliant and various colours both of leaf and flower, and their wonderful adaptation to the circumstances which influence the selection and cultivation of exotic plants in this country. Our summer sunshine is sufficiently fierce for them; and although our winters are always too wet and usually too cold, the most commonplace means of protection suffice for their preservation. They are most easily multiplied by means of either seeds or cuttings; they grow rapidly and flower freely, and altogether require less care and make more show than any other plants that properly belong to the greenhouse and the garden. The different groups of fancies, zonals, tricolors, and the rest, require different management, but all agree in loving light; all are adapted for pot culture; and the greater part of them thrive in a comparatively poor soil and a dry atmosphere. During winter dryness is quite as important as warmth for their preservation; for, indeed, when kept cool, dry, and well aired, they will suffer but little if the thermometer in the house should descend to 27° Fahr.; in other words, they will endure five degrees of frost, but they should never be intentionally subjected to a temperature below 35°, and an average of 40° is safer for their winter keeping.

Large Flowering or Show Pelargoniums.—These are the aristocracy of the race, and until quite lately, they were the most attractive subjects presented at flower-shows in the months of May and June. They are worthy the best care of the amateur because of their fine decorative properties and variety of colours. The cultivation may be commenced at any season, but the best time is the beginning of the year, and neat young nursery plants are the best to begin with. If when they come to hand, they are nicely rooted, shift them into a larger size, if, however, they are not well rooted, defer the repotting for a month. In either case they should be placed in a light and airy position in the greenhouse, and be watered cautiously. A fortnight or so after they have been repotted pinch out the *points of* the young shoots to promote the formation of bushy

specimens, and when it becomes necessary train out the side-shoots by means of neat sticks. Those intended for exhibition must have the branches brought close down to the rim of the pot, and be kept down as much as possible during the first year; but the growth of those intended for conservatory decoration will merely require tying out to admit a free circulation of air amongst the branches, and for securing a regular well-balanced outline when they are in flower. Upright growing plants with heads of bloom about twelve or fifteen inches in diameter are the most useful for the conservatory, and therefore excessive training must be avoided.

Remove them from the house when done flowering and place the pots upon a bed of coal-ashes, and if practicable shade them for a few days to allow the wood to become slightly hardened before they are exposed to the full influence of the sun. Henceforth they must have free exposure to the weather, and in a fortnight or three weeks the wood will be matured sufficiently to allow of their being cut down. The soil should also be kept as dry as it is possible to keep it wi hout allowing the leaves to flag. In pruning, cut back the young shoots to within two or three buds of the old wood, according to their respective positions, but the chief aim must be to ensure a symmetrical appearance. In wet seasons they should be placed in a cold frame, and the lights drawn off at all times, excepting when they are required to protect the inmates from the rain. No water must be applied to the roots from the time they are cut down until the young growth is about half an inch in length, but they will receive much benefit from a sprinkle overhead in the afternoon of a dry hot day. When the young growth has begun to push, turn them out of the pots, remove nearly if not quite all the old soil, trim the roots slightly, and put each in a pot one or two sizes smaller than it previously occupied. Water very sparingly until they are well established in the new soil. Even then, no more water must be applied than is absolutely necessary to maintain a steady growth. Early in September remove to the greenhouse for the winter, and the only attention required to keep them in health will be to supply them with water when necessary, and to keep the foliage free from green-fly.

Some time during January of the following year, repot all that require a shift into pots two sizes larger; that is, those occupying three-inch pots should be put into the six-inch size,

and those in five-inch into pots eight inches in diameter. No further shift will be required until after they have done flowering. After the end of February the young shoots will make vigorous progress, and should be tied neatly, and their points nipped out. In succeeding years, when the period of flowering will be more under the control of the cultivator, the specimens intended for flowering in May must receive their final stopping in January; for June, in March; and for July, some time towards the end of April. Those required for May must receive their final shift in October, and be placed in a temperature a few degrees higher than that required for the remaining portion of the stock. After the first season's growth the plants should, as soon as they are well established in the pots in which they are to flower, be watered with weak liquid manure until the flowers open and with clear soft water at all other times. They winter best in a temperature ranging between 40° and 50°, according to the weather, and with just enough fire-heat to keep the frost out and the atmosphere dry.

A compost consisting of three parts sound turfy loam, and one each of well-decayed hotbed manure and leaf-mould, and half a part of sharp silver sand, will grow all the large-flowering varieties to perfection. The soil must be used in a moderately rough condition, and the loam and manure be well mixed together. The compost should, if possible, be prepared six months beforehand, by placing the manure between the layers of loam when it is stacked up in a heap, as it comes from the pasture or common.

Cuttings of well-matured wood cut up into lengths of two joints each, with a young side-shoot proceeding from the top joint, strike freely. Prepare by cutting them close under the bottom bud, and remove the lower leaf. Insert in cutting pots, prepared in the usual manner with a layer of dry sand on the top, and then place in a cold frame. Keep rather close and shade moderately during the first week or ten days, and then ventilate freely, and expose to the full sun. Pot off as soon as nicely rooted, and if they are stopped when well established and shifted into five-inch pots about a fortnight or three weeks afterwards, they will make good specimens by the following season.

The fancy varieties are more difficult to strike than the show kinds, and therefore require more care and attention, and it is *as well to give* them the advantage of a mild bottom-heat, if

available; but the atmosphere must not be moist with steam arising from fermenting materials. Otherwise the fancies require the same treatment as the show varieties, and may, with advantage, be located at the warmest end of the geranium-house.

Forcing Pelargoniums are grown in great quantities for Covent Garden Market, but are generally considered by amateurs too troublesome to be worth a place in the private greenhouse. It requires some skill to do them well, but when well done they charm away the gloom of winter, and proclaim the cultivator a master of the art. As regards quality the flowers are not so fine as those of varieties flowering later in the season, but they are produced in greater abundance, and the habit is rather better. It would not be fair to compare the flowers of the two classes, for the early flowering varieties bloom so early with a proper system of management, that they should be out of bloom and removed from the conservatory by the time the later blooming kinds are ready to take their place.

It is best to begin in July with plants a year old. If you must begin with cuttings, secure them early in March, and strike them on bottom-heat, and have the young plants in separate pots in the greenhouse at the beginning of May, when they should be potted into large 60's and removed to a cold frame. If this plan is not suitable to your case, secure cuttings in June, and strike them under a hand-glass without heat, and make the most of the short season of growing weather that remains.

About the middle of June, or earlier, if the season is forward, those in the cold frames should be removed to a bed of coal ashes a foot in thickness, in an open sunny spot. A mere sprinkle of ashes will not suffice, for wherever a worm finds entrance, the plant will suffer by it. In the first week of July stop all the young shoots, and before the month is out shift into 48's or 32's, and return them to the bed of ashes. In the first week of September the stock should be brought into the greenhouse, be placed close to the glass, and have an abundance of air. Ventilate the greenhouse freely when the plants are first brought indoors in September, to lessen the change as much as possible. In a fortnight afterwards they will begin to feel at home, and, as the weather will be getting colder, less air will be necessary. Air-giving must at all times be regulated by the state of the weather outside. In dull, damp

weather use a little fire-heat to admit of the ventilators being opened for a short time during the early part of the day, rather than keep them closed for fear of the house getting too cold. It is an important matter not to deprive the plants of a breath of fresh air for the sake of a few shovelfuls of firing, when air can be admitted without injury.

If carefully wintered they will flower freely from early in March until the following May, or longer, if required. They are, however, not required after the middle of the last-mentioned month for conservatory decoration, as varieties with more highly finished flowers will be coming freely into bloom. About the middle of May place the plants in a dry airy house, where they will receive just sufficient protection from frost. Early in June place them out of doors on a bed of coal-ashes to ripen the wood, and immediately that is accomplished cut the shoots back to three or four buds each, in the same manner as other varieties. Let them remain on the bed of ashes until the young shoots are about half an inch long, and then shake out, carefully prune the roots, and repot in six- or eight-inch pots, in which they will remain until the next year. When potted, they should be placed in a cold frame, and have the freest ventilation possible. The lights should only be put on in wet weather, and then they should be tilted back and front, the object being merely to protect the plants from becoming too wet at the roots. No stopping will be required after the first shoots have had the points nipped off, as these varieties have a very compact branching habit, and bushy well-shaped specimens can be obtained without excessive pinching and stopping. In September they must go to the greenhouse, and from that time receive the attention advised for the young stock the previous season.

To secure a good bloom of forced geraniums in October is easy enough, but there must be no stint of care in summer and no stint of firing in winter. Make and manage the plants, as advised above for flowering them in March. Put them in a cold frame at the end of May, and thence remove them to a bed of ashes in the open in June, pinch out the points of all the shoots the first week of July, and carefully shift them into one size larger pots in the last week of July. House them in September near the glass and give plenty of air. As the weather becomes dull and damp, start the fire gently and give air with more caution. They are not to be hard forced, but

they must have no check. The temperature must average 50° by night and 60° by day, and a little air must be admitted every day, and all day, unless the weather is very bad; but it must not reach the plants until it has acquired the warmth of the house. The plants must have more water than others of the same kinds that are at rest, and as the days lengthen in spring it will be prudent to assist them with very weak manure water, but this must not be given if they are evidently robust and healthy. They should flower freely from October to May, and plants in 32-size pots should be two feet high and two feet through, and as gay as flambeaux at Christmas. There are many varieties for forcing pelargoniums in the market, but probably in our time we shall not see one to surpass, or even equal, *Gauntlet* for early work.

Zonals.—If we may be excused pronouncing eulogies on this important section of the great family of geraniums we will endeavour to make amends by concentrating in a few pages as much sound information on their management as pot plants as any less experienced pen would require a volume to unfold. So, good amateurs, we begin by remarking that the first step towards success is to make a good selection, for only about a tenth part of all the zonals in the trade lists are worth the trouble of pot culture. If you will have such sorts as *Christine*, *Tom Thumb*, *Stella*, and *Indian Yellow*, you will waste all your time in growing them, for good as they are when bedded out, they are quite incapable of acquiring a respectable appearance as pot plants. The achievements of cross-breeding in this branch of floriculture are truly wonderful, for not only are the finest of the newer varieties characterised by flowers of great size, of a perfectly circular outline, the petals of which overlap, so as to produce a solid disk; but the inequality of the petals has been abolished, and they rebuke and confound the botanists by presenting symmetrical flowers on plants that are designated pelargoniums. With such fine varieties as *Sir Charles Napier*, *Richard Headly*, *Ianthe*, and *Mrs. Sach*, the amateur may labour in hope that, in due time, he shall be repaid, if he faint not.

When zonals are to be grown into specimens, it is a good plan to plant them out the first season, and allow them one year's growing in the open ground, to form a good foundation of stout wood. They should be put in good unmanured ground,

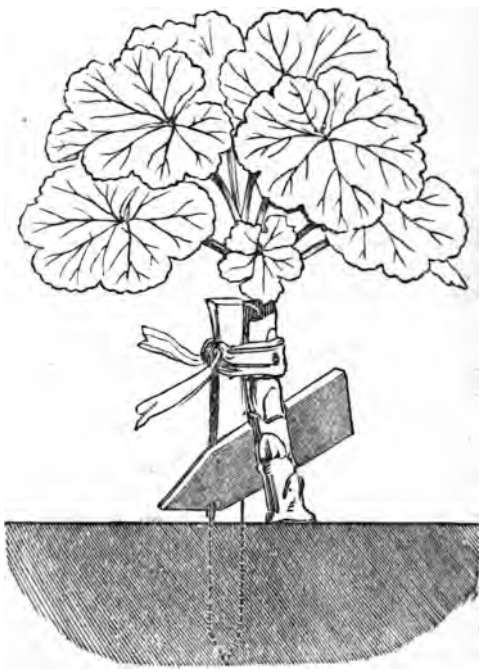
in the full sun, and before planting them it will be well to cut them into shape, and allow them time to make a fresh start before disturbing the roots. They must not be allowed to flower, and the points of all the shoots should be pinched out when two inches long, and the last stopping should take place in the first week of August. In the first week of September take them up carefully and pot them in six-inch pots, and shut them up close for a week. Afterwards put them in a light airy part of the house; keep them rather dry all the winter; in February stop them all over, or sufficiently to promote the filling-up of gaps and uniformity of contour, and in March shift into eight-inch pots. If they are intended for conservatory decoration they need not be trimmed or tied, but if for exhibition they must be moulded to the watch-glass shape by means of sticks and wires.

A good compost for single zonals may be prepared by mixing together five parts of good turfy loam with one part each of thoroughly decayed hotbed manure, leaf mould, and sharp sand. The double zonals are so vigorous in habit, that in preparing a compost for them it will be well to omit the manure and to give them less root room than the singles, for if they acquire any degree of grossness through good living, they will have more the appearance of cabbages than geraniums, and will probably not flower sufficiently to afford excuse for likening them to cauliflowers.

To ensure a good bloom of zonals in winter, begin with young plants in three-inch pots in April. These should be the best obtainable from cuttings struck the previous autumn. Shift into six-inch pots, and put them in a cold pit and ventilate freely. In the first week of June put them in the open, on a bed of ashes or leaves, and keep them growing freely, and from time to time pinch out the points of the shoots both to promote the growth and prevent flowering. In July shift them into eight-inch pots, and return them to the bed in the open. About the 10th of August stop them all over for the last time. About the 10th of September house them near the glass, and give plenty of air. As the dull cold days approach, begin to force them, but in a very gentle manner, and you will soon have flowers in galore. The temperature should average 50° by night and 60° by day, with a rise to 65° during sunshine.

TRICOLORS make fine pot plants, and it is necessary to grow

them if we wish to appear votaries of fashion. Those that are required for winter decoration should be planted out from the end of May to the end of August, and be carefully stopped, as requisite, to promote a dense bushy growth. After potting keep them cool and airy, and otherwise treat them as advised for the zonals that are required for winter flowering, but with extra caution as to watering. It is common enough to meet with starving bits of tricolors that have been in pots for years and incline to grow smaller rather than larger; but if they were first cut back, and then planted out from the latter part of May to the middle of June, and taken up in September, they would become respectable plants in the course of one season.



In propagating tricolors, cuttings should be taken as early in the summer as they can be obtained, as they root slowly, and must be potted early to ensure their well-doing through the winter. If propagated in quantity, a bed should be made in a cool greenhouse by mixing equal parts of sharp sand and cocoa-nut fibre refuse, as in such a mixture they root quickly and make better roots than in any other kind of compost. The amateur in tricolors must learn to bud and graft them on the stems of seedling zonals, for all of them grow more vigorously

if well put on, and by judicious management handsome standard tricolors may by this practice be obtained.

It is often a matter of importance to propagate tricolors in winter as well as in summer, and this may be accomplished easily by the aid of a bed of moist sand, or a mixture of sand and cocoa-nut fibre refuse, over a tank of hot water, at the warmest end of the greenhouse. The bed should have a constant temperature of 70° to 80°, and be in the fullest daylight obtainable. If the cuttings are inserted in the usual way many of them will rot, and therefore Dr. Denny's plan should be resorted to. This consists in first tying the cutting to a short stick, and then inserting between stick and stem another stick placed horizontally to keep the upright stick and stem apart. The upright stick is thrust down into the soil so deep that the base of the cutting barely touches the surface, as shown in the figure. The roots are thrown out from the base, and the cutting begins to make new leaves, and must then be carefully potted in sandy soil in the smallest sized thumb-pots, and the pot plunged in the bed or put on a warm shelf to encourage it to become a healthy plant. The figure (p. 139) will explain the matter if the description of the process is not quite clear.

SEEDLING PELARGONIUMS.—To raise seed is easy enough, but systematic cross-breeding is an art to be acquired by patient observation, persevering practice, and the stimulus of unfaltering hope. If there are no bad geraniums in the garden, a few seeds may be allowed to ripen on the most distinct varieties in the collection, and from these something new and good may be expected. If you have a house kept at a temperature of 50° to 60° all the winter, sow the seed in August and get the plants into small pots in time to winter them in comfortable quarters. If you have only cold pits and other rough contrivances for wintering the plants, defer sowing until February and then start the seed in a nice heat. As soon as the plants are large enough pot them in thumbs, next in 60's and finally in 48's. In the last-named size they should be allowed to flower, as it is waste of labour to grow specimens of plants that may prove to be worthless. As the flowers open destroy those that are manifestly bad and take cuttings of all that promise to be worthy of a second trial. By good management seedling pelargoniums will begin to flower in 100 days from the date the seed was sown.

CHAPTER IX.

THE FUCHSIA.

THE Fuchsia needs no praise, and strange to say, there is not much to be said on the subject of its cultivation. At all events it is our intention to dispose of the matter in a few words, and we shall have to include in a short chapter all that really need be said about it. If we hammer too hard and too long on a soft subject, we shall probably crush it out of all identification, and none of our readers would wish to see the fuchsia obliterated by needlessly prolix directions for its cultivation.

The fuchsia requires to be grown rather fast, and therefore a starving system must not be practised. It loves warmth and moisture and some amount of sunshine. It cannot endure a dry soil or a dry air and a long-continued roasting glare of sunshine. No matter whether you wish to grow nice little bushes for a small greenhouse or the sitting-room window, or giant pyramids for a flower-show, the routine practice will be very nearly the same, and the few differences to be made will be taken note of in the directions that follow.

If grand specimens are desired take cuttings in September, but if only plants of moderate size, take them in spring as soon as you can get them. In the month of February prune a few old plants into shape and put them in a temperature of 60°, and keep them regularly syringed. In the course of a month they will supply you with any number of cuttings, and to strike these is the simplest task in propagating the greenhouse will ever afford you.

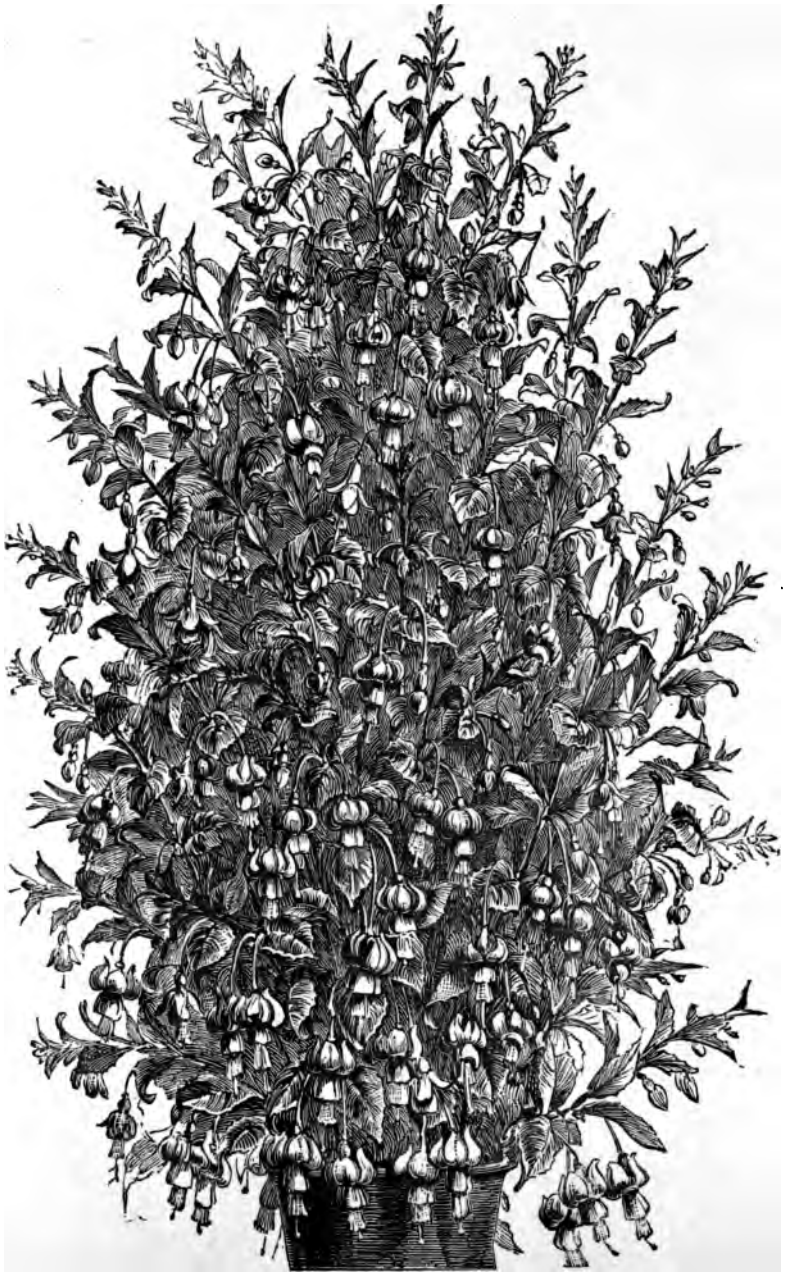
At the earliest moment the cuttings should be potted off into small sixties and soon after be shifted into forty-eights, then into twenty-fours, and, lastly, into eights or sixes. The size of the final shift must be determined upon by the cultivator, but if very large plants are wanted the last size is the

best; and when plants are grown exclusively for the con-



PYRAMID FUCHSIA (*Six months old*).

servatory, twelves are a very handy size. It is a bad plan to *over*-pot at any time, but they should not get much pot-bound,



SPECIMEN PYRAMID FUCHSIA (Second year)

for the roots are too slow in finding their way into the fresh soil, and the whole mass will in consequence get sour.

For a compost use two parts nice fibry loam, and one part thoroughly decayed manure with a little rotten leaf mould and a good sprinkling of silver sand. If the loam is deficient in fibre, it is best to have one part of rough peat and two of loam. A little cocoa-nut fibre refuse is very well to mix with the soil; it keeps it open and porous, and assists the formation and easy extension of the roots; but it is not advisable to add much of the refuse, for it will not afford much nourishment to the plants. The soil should be used rough; the larger the pot, the more lumpy should the soil be. The pots should be moderately well drained and the plants potted firm, but not rammed too hard. If the plants do well, they will make good-sized specimens, suitable for exhibiting in September; but it is advisable not to allow them to flower the first year when they are intended exclusively for exhibition, and then they make good plants for the following season.

The best shape to train them to is the pyramidal, and every care must be exercised to get them well furnished to the very bottom. Sometimes the plants will throw side shoots close to the soil, and at others they will not do so without stopping. But at all times it is as well to nip the top out when they get about a foot high; it strengthens the side shoots. As soon as these shoots are three or four joints long they must have their tops nipped out, and as they grow again they must be regularly pinched, to get them into a good shape, and if the leading shoot is inclined to rob the side branches, it is best to stop it, and let another young one run up. The main stem must have a good stout stake to keep it upright. For standards no training is required beyond rubbing off the side shoots, and letting the main stem run up to whatever height is required. It must then be topped and allowed to throw out shoots, which must be pinched twice or three times to form a handsome head. For dwarf bushes, the young plants must be stopped when eight or nine inches high, the young shoots again stopped and then trained out neatly with sticks.

The plants should be stood out of doors for a month or so to ripen the wood in the autumn, but they should be housed before any severe frost sets in, for though a few degrees will not do much harm, they are quite as well without it. It is a bad plan to store the plants away for the winter in outhouses,

where they can receive no attention; they never break so regularly and well in the spring if they get dry during winter, though it is very little water that they want for three or four months in the dormant season. Well made standards must, indeed, be kept growing slowly all the winter.

Prune the old plants towards the end of February, and stand them in a peach-house which has been started a few weeks before, and as soon as they begin to break take them out of the pots, and remove as much of the old soil from them as you can without injuring the roots, and put them into pots two sizes smaller or in the same pots again, and keep them well syringed from the time they are started until they begin to flower. From 50° to 60° is a good heat for growing fuchsias at all times, but if they are wanted to be in flower at any particular time, they will stand 70° or 80°, but of course the wood is much longer jointed when they are grown in a high temperature. The plants should not be stopped for six weeks to two months before they are expected to be in flower. If the drainage is good, they will take plenty of water when in vigorous growth, and a dose of weak manure water twice a week will be highly advantageous in promoting the growth and production of large finely-coloured flowers. It is not advisable to shade fuchsias much, though they will not stand much sunshine. It is also not well to play the syringe on them when they are in flower, for the splashing about of the water disfigures the leaves. Any kind of liquid manure will do for fuchsias, if it is not too strong. If you have to prepare it for them there can be no better plan than to put fresh horse droppings into a tub of soft water, and to use the solution quite clear and diluted to the colour of pale ale. It should be of the same temperature as the house the plants are in, or even one or two degrees warmer: colder it must not be.

CHAPTER X.

HARD-WOODED GREENHOUSE PLANTS.

In this chapter we shall have to treat of a number of plants that differ wonderfully in constitution and requirements, and therefore it will be impossible to give any general directions for their cultivation on the plan of an introduction. A considerable proportion of them need abundance of light and air, and the more hardy of their number are impatient of artificial heat, and consequently must not be subjected to a high temperature in winter without due consideration of their ability to endure the trial. Not a few subjects in the list that follows require a practised hand and an experienced judgment for their successful management, and, as a rule, the cultivation of hard-wooded plants belongs to the higher range of horticultural practice.

Abutilon.—These are best adapted for training to pillars, but by a judicious system of pruning, bushy specimens may be produced, which will have a most effective appearance. In a young state the leading shoot will require stopping to encourage the production of side shoots, and in the following and subsequent winter seasons prune them to within two or three joints of the base of each shoot. By allowing the young shoots to grow unchecked and neatly tying them out, well-balanced specimens that will flower freely may be obtained in a comparatively short period. The green-leaved species such as *A. striatum* require a mixture of peat, loam, and leaf-mould, but for the variegated forms, as for example *A. Thomsoni*, fibrous peat and sand will be preferable. The young shoots taken off in the spring with a small heel strike freely, provided the cutting pots can be plunged in the cucumber or melon frame.

Acacias.—These may be divided into two classes, o

comprising the comparatively small rigid growers, and represented by *A. armata*, and the other the more robust species, slender in growth and having feathery foliage, and represented by *A. dealbata*. Those of the first section may be propagated by means of cuttings, and can be kept in proper shape by pruning. The others are most readily propagated by seed, and must not be pruned so severely, especially after they have attained a large size. They all thrive in a mixture of peat, loam, and leaf-mould, or they may be grown in loam and leaf-mould alone.

The points of half-ripened shoots make the best cuttings, and therefore the summer season will be found the most suitable for increasing the stock of the small growing kinds. The spring is the proper time for sowing the seed, which should be soaked in warm water some time previously. Whether raised from cuttings or seeds, the young plants will require stopping once or twice after they are established in the small pots in which they are put when potted off singly, to induce them to produce an abundance of side shoots, and thus form a good foundation for bushy specimens. Acacias of all kinds require liberal supplies of water during the spring and summer, and at no season of the year must they suffer from an insufficiency of moisture at the roots. Should any of the specimens become infested with white scale, the best course will be to destroy them and commence with young plants from a clean stock, for it is impossible to thoroughly eradicate the pest when it has once become established. The time to prune is just previous to their commencing to make new growth. All the species may be grown in pots or be planted out in the conservatory border. Some of the robust growers, especially *A. Riceana* and *A. dealbata*, are very valuable for training over pillars and girders in large conservatories.

ADENANDRA.—*A. fragans* is a good plant. It has a naturally bushy habit, and the only special attention required is to tie out the shoots with the aid of neat stakes. The flowers are produced at the tips of last year's shoots. Peat and silver sand form the proper compost; and in shifting the plants into large pots it is of the highest importance to press the soil very firm. Careful watering is very essential at all seasons.

APHELEXIS.—These require careful attention at all times,

for if they suffer from neglect or bad management of any kind they quickly perish. They are propagated by means of cuttings; but the latter are difficult to strike, and the amateur will act wisely in purchasing thrifty plants in five-inch pots. Fibrous peat with which a moderate proportion of silver sand and either small crocks or nodules of charcoal have been added, will be the most suitable compost to use. They must not be overpotted, and after they have grown into specimens a shift every second year will be sufficient to maintain them in a healthy state. Especial care must be taken to have the pots thoroughly clean, the draining perfect, the peat of the finest quality, and to press the soil with an equal degree of firmness all round the sides of the pot. A light airy position is essential to all seasons of the year, but more especially during the autumn and winter months. The soil must be maintained in a moderately moist condition at all times, and in the application of the water, care must be taken to ensure every portion of the ball being properly moistened, and no more must be applied until the soil has become rather dry again. The mode of growth will indicate the proper system of training, and this must be done some time during the winter. The flowers are produced at the points of the shoots, and when they begin to fade they should be removed by cutting them off, with a portion of the stem, just above the young shoots.

Boronias.—These are all of moderate growth, and with but a very small amount of trouble neat specimens may be produced. They require a mixture of two parts peat, one part fibrous loam, and a plentiful addition of sharp silver sand. They are propagated freely by means of cuttings, provided the points of short-jointed shoots are selected when the wood has become rather firm. They require a light airy position, and when employed in the decoration of the conservatory care must be taken to avoid putting them too far from the glass, or where they will not enjoy a fair share of air. They require the same care in watering and repotting as other delicate-rooted hard-wooded plants. It will be necessary to stop the young shoots once or twice when the plants are in a small state, but after they are shifted into five-inch pots the growth must be regulated with the aid of neat stakes.

Chorozemas.—These attractive plants are of free growth,

and well-furnished specimens may be produced in a comparatively short space of time. A good stock may be propagated without difficulty, provided the small side shoots are selected for cuttings when moderately firm in the early part of the summer. Some of the species can be propagated by means of seed sown and otherwise managed as advised for acacias. Good fibrous peat two parts, mellow turfy loam one part, and a part of small crocks, nodules of charcoal, and silver sand, mixed together in equal proportions, will form a compost in which they make the most vigorous progress, and produce their flowers in the utmost profusion. They must not be overpotted even when in a young state, and after they have attained a considerable size a shift once every second year will be ample. During the first year, and probably the second also, it will be necessary to pinch back the leading shoots once or twice to promote the production of side shoots. They are mostly of a straggling habit, and the training must be commenced at a very early period, and in each year this should be done during the autumn or winter, as they naturally flower early in the season, and it is difficult to train them properly after the flower-buds are formed without breaking off or otherwise injuring a portion of them. A light and airy position is of the first importance, especially when they are making their new growth; for if they are too far from the glass or crowded up with other plants, the wood will be thin and long-jointed, and in consequence they will flower unsatisfactorily the following season.

Correas.—These produce their flowers during the winter. They are neat in growth, and thrive in good fibrous peat and silver sand. They are propagated by grafts and cuttings. The points of the side-shoots make the best cuttings, and they should be taken when the wood has become rather firm. Unless the plants grow out of shape, which can be easily prevented, they will require very little pruning beyond the removal of a branch occasionally. During the summer season place them in the open air, to ensure the thorough maturation of the new wood.

Crowea.—A peaty soil, moderate supplies of water, and a light position, are the main essentials to success in the cultivation of croweas. The short-jointed side shoots strike rather

freely, provided they are taken when the wood is moderately firm, and the cuttings covered with a bell-glass. It is necessary to practise a judicious system of stopping when the plants are young, to ensure the production of bushy well-furnished specimens. They are exceedingly impatient of artificial heat.

DAPHNE.—The flowers of the greenhouse Daphnes are valued for bouquets during the winter season, for they are delightfully fragrant. Increasing the stock by cuttings is attended with such uncertainty that they are usually grafted upon *D. laureola*, which can be raised from seed. The seed is a long time in vegetating, and, considering the trouble attached to the grafting, amateurs will do well to procure healthy plants of a small size from a nursery. An open position out of doors during the summer season will benefit them, and if there is a probability of the flowers being required before the usual time, they may be placed in the early part of the winter in a temperature of about 55°; but, as they flower early in the new year, no forcing whatever is, as a rule, required.

DILLWYNIA.—A few of the species belonging to this genus are very interesting and attractive. They require fibrous peat to which a liberal proportion of silver sand has been added. After they have done flowering prune them back, and when they have fairly started into growth again place them in the open air. They must not be exposed to continuous rains, for if the soil remains for any length of time in a saturated state the young roots will perish.

DRACOPHYLLUM.—The pretty white-flowered *Dracophyllum gracile* is as useful for conservatory decoration as it is valuable in competitive groups. It should be potted in peat chopped up rather fine and mixed with a liberal quantity of silver sand. Specimens trained as bushes are more pleasing and effective than those trained to wire trellises. To produce these, stop the young shoots twice during the first two years after they are potted off singly. Afterwards the growth must be trained out nicely with the aid of neat stakes. As the flowers fade prune back the growth of the preceding season, and when the young shoots are an inch or so in length place the plants out of doors. They must not remain out of doors late in the autumn. It is advisable to keep them indoors altogether

during wet summers. The points of the partly-matured shoot are the best for cuttings, but they do not strike freely.

GENETYLLIS.—These are remarkable for the distinct character of the flowers during the early spring months. A mixture consisting of three parts fibrous peat, one part turfy loam, and a liberal quantity of sand will form an excellent compost. They may be placed in the open air during the summer, but must be protected from heavy rains. After the necessary stopping of the young shoots during the first year or two, no pruning will be required unless from any cause the specimen suffers from neglect and grows out of shape.

ERIOSTEMON.—These are valuable for the freedom with



ERIOSTEMON CUSPIDATUS.

which they produce their flowers during the spring and early summer, and the ease with which they can be cultivated successfully. They require a dry and cool position during the winter, and should be placed out of doors in the summer. They thrive well in peat and loam incorporated together in equal proportions, and a liberal quantity of sand then added. They can be pruned if necessary, but with proper management no pruning will be required. Three kinds will suffice for a small collection, and the best three are *E. buxifolius*, pink; *E. cuspidatus*, red; and *E. latifolium*, white.

EMBOTHRIUM.—A splendid genus of nearly hardy shrubs adapted for the cool conservatory. The soil they require is a



EMBOTHRIUM COCCINEUM.

mixture of good turfy peat and loam with a little sharp sand. *E. coccineum*, the flowers of which are of a dazzling scarlet colour, is the most to be desired, but *E. strobilum* is worth a place in any collection.

ERYTHRINA.—When well grown the members of this genus are exceedingly attractive. They require a rich compost, and a mixture of two parts turfy loam and a part each of fibrous peat and well decayed manure suits them admirably. Towards the spring prune the shoots to within a short distance of the base, and when they afford an indication of starting into growth turn them out of the pots, remove the old soil and repot them. Soon after they have done flowering they will go to rest, and the water at this stage should be gradually lessened and finally withheld altogether, as the soil should be kept quite dry during the winter. The stock may be increased by taking off the young shoots when about three inches in length with a small heel, and inserting them round the sides of cutting pots filled with a light sandy compost. The cuttings strike more freely when the pots are plunged in a brisk bottom-heat. They require a moderate amount of pot-room and will receive much benefit when in full growth from liberal supplies of liquid manure.

GOMPHOLOBIUM.—The main essentials in the cultivation of these interesting plants are a light position, perfect drainage, and an open compost. The latter should be prepared by incorporating together equal parts turfy peat and loam, and liberal quantities of silver sand and nodules of charcoal. The species of a scandent habit will require a neat wire trellis for their support. They should be placed out of doors during the summer season, for the purpose of ensuring a thorough maturation of the young wood.

GREVILLEAS.—Generally grown for the graceful appearance of the foliage. They require a compost consisting of fibrous peat and loam and a moderate proportion of sand. An open position in the conservatory is necessary, and they may be placed out of doors in the summer. For the cool conservatory they are useful and interesting plants. *G. alpestris* with flowers red and yellow, and *G. rosmarinifolia* with red flowers

are the two best, but a dozen or more good species may be found.



GREVILLEA ALPESTRIS.

HABROTHAMNUS.—Owing to their robust habit, these are best adapted for training to pillars in large houses, but with care bush specimens may be produced. When grown as pot specimens it will be necessary to first form a foundation by stopping the young shoots once during the first year or two, and afterwards to prune early in the spring all the shoots back to within one or two buds of the base. They must be kept rather dry at the root when pruned, and as soon as they are fairly started into growth again turn them out of the pots, and after removing a portion of the old soil repot them in clean pots and a fresh compost. They will grow freely either in peat or loam, but the best compost for them is a mixture

of peat, loam, and leaf-mould. When grown as bush specimens the shoots will require to be tied out, but when trained to a pillar or wall they should be allowed to grow in a natural manner.

HEBECLINIUM.—The chief value of these consists in their adaptability for winter decoration. They are all of comparatively rapid growth, and strong bushy specimens may be produced by the autumn from cuttings struck in the spring. If it is desired to keep the old plants, prune them rather severely, and afford them the assistance of a genial temperature and moist atmosphere until they have commenced to make new growth.

HOVEA.—Like other hard-wooded plants of a similar character, these require an airy position in the greenhouse during the winter, and to be placed out of doors during the summer. A mixture of peat, loam, and sand forms a very excellent compost. The Hoveas are exceedingly valuable for the distinct colour of the flowers—namely, deep blue. They are well adapted for occupying prominent positions in competitive groups, although seldom seen at public exhibitions.

LABICHEA.—The only species grown, *L. diversifolia*, is well deserving of attention. The flowers are deep yellow and freely produced. A peaty soil is the most useful.

LAPAGERIA.—Although a climber, the Lapageria is in every way suitable for growing in large pots and training to a balloon or similar-shaped trellis. Turfy loam and peat in equal parts, with a moderate proportion of small crocks, nodules of charcoal, and silver sand, form a very suitable compost. The drainage must be perfect, for during the summer season almost unlimited supplies of water will be required, and means must consequently be provided for the ready escape of superfluous moisture. If this is not done the soil will soon become sour and the roots will perish.

LESCHENAULTIA.—Although more difficult to cultivate than a few other subjects, good specimens may be produced with ordinary care. They require an airy position near the glass during the winter, otherwise the tips of some of the young

shoots will perish from the damp settling upon them. When placed out of doors during the summer, means must be adopted for their protection in case of heavy rains. They must also be taken indoors early in the autumn. They thrive in good fibrous peat chopped up rather fine and mixed with a liberal quantity of silver sand. Careful watering is essential, for they suffer severely if kept either too wet or too dry for any considerable period. Cuttings of the tops of young shoots when about half-ripe strike freely with the assistance of a mild bottom-heat and the protection of a bell-glass or propagating frame.

LEUCOPOGON.—These all require much the same soil and management as the Epacris, but they do not require such hard pruning.

LISIANTHUS. These are rather difficult to manage, and a considerable amount of skill is necessary to produce large well-developed specimens. They are propagated by seed, which should be sown early in March. Sow on the top of the soil, and lay a flat piece of glass over the pot. When the young plants are large enough to handle, which will be in eight or ten weeks after they make their appearance above the surface, pot them off singly, and place them where they will receive the assistance of a genial bottom-heat. Here they should remain until the end of September, when they may be removed to the greenhouse, and placed in a warm corner. In March shift them into larger pots, and, if practicable, stand the pots upon a genial hotbed. Equal parts of loam and decayed manure, and two parts of peat, will, with the addition of a liberal quantity of sand, form excellent compost.

MACLEANA.—A compost consisting of equal parts of turfy loam and peat, well-drained pots, and moderate supplies of water are the main essentials of success in the cultivation of these plants. They do not require such a dry and airy position in the greenhouse as a few other subjects mentioned. Proper training must be practised from the first, as they are somewhat straggling in growth.

NERIUM.—To have these in perfection they must be pruned carefully, have a season of rest annually, and be shifted once a year or be assisted with liquid manure. It is impossible to

have satisfactory results when the plants are kept starving in the same pot for several years and not pruned. Shift them in the spring, and after they are well rooted water alternately with weak liquid manure. After they go out of bloom keep them rather dry at the roots for a short time, and then prune all the young shoots back to within two buds of the old wood. As the season will be advanced, assist them to start into growth quickly with the aid of a mild bottom-heat and the temperature of an intermediate house. To prevent the flowers been hidden with foliage, as is frequently the case, remove the shoots which start just below the flower-buds as soon as they begin to push. Besides hiding the flowers, they deprive them of a considerable share of support, and their removal is therefore of considerable importance. Good turfy loam three parts, peat one part, and well-decayed manure or leaf-mould one part, form a suitable compost.

PIMELEA.—These deserve all the attention necessary to produce good plants. They may be propagated by means of cuttings when the new growth is partly ripe, but they are difficult to increase. Shift such as require that attention early in the spring, and after the flowers have faded place them out of doors to mature the young growth. The most suitable compost is prepared by mixing together three parts peat, one part loam, and half a part of silver sand.

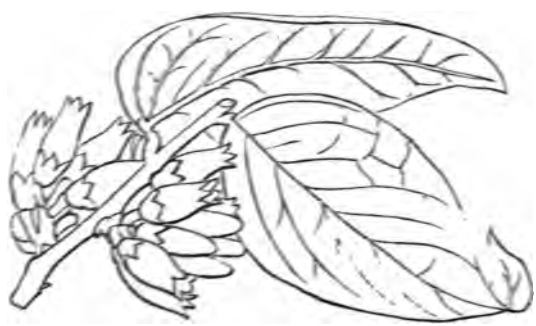
OXYLOBIUM.—There is nothing special in the cultivation of these interesting plants. They require sandy peat as a compost, well-drained pots, and a light and airy position in the greenhouse. They may be placed in the open air during the summer.

SERISSA.—A small group of white flowering shrubs nearly hardy, and therefore valuable for cool houses. The soil should be sandy loam full of fibre or good peat. The best are *S. multiplex*, bearing double flowers, and *S. fœtida foliis aureo-marginata*, which is a very pretty plant in spite of its elongated name. These are well adapted for planting out in a border in an unheated conservatory, as they grow freely and take care of themselves. They are neat and lively plants, though not showy.



SERISSA FOETIDA.

THIBAUDIA.—This is a genus of superbly fine flowering shrubs closely allied to Vaccinium. They require the same treatment



THIBAUDIA JESSICÆ.

as heaths, but must have the temperature of an intermediate house. To grow any number of them stove heat will be required, but *T. pulcherrima* with red flowers, and *T. jessicæ* with pink flowers, may be very well done in a warm greenhouse.

VACCINIUM.—A pretty group of heath-like plants, mostly hardy. We can select three beauties from the genus for the cool conservatory, where they will answer admirably to clothe



VACCINIUM SERPENS.

rock-work if planted in sandy peat in a light, airy, sunny place. Their names are *V. leucostomum*, with flowers scarlet and white, *V. Rollisoni*, flowers scarlet, and *V. serpens*, with elegant myrtle-like leaves and rich crimson flowers.

CHAPTER XI.

THE ERICA AND THE EPACRIS.

If we could take a census of failures in plant growing, we should probably find the greatest proportion of the whole number associated with the Erica and the Epacris. It must be confessed that to be thoroughly successful with these beauties a somewhat broader exercise of judgment and patience is required than with many other classes of plants that are equally popular and perhaps, in their way, not less beautiful. But above all things steadfastness is essential to success, for a few small errors, omissions, or eccentricities of management, may destroy in a wonderfully short space of time the results of the best cultivation ever seen or heard of. The greenhouse heaths require no subtlety of superintendance, and in respect of their cultivation there is really not a single solemn secret to be divulged. All that needs be told about them may be comprised in one short chapter, and whoever will carry out our instructions faithfully, may, by the practice of patience and an observant habit, rise to the highest excellence in this fascinating and most remunerative branch of practical horticulture.

To begin with the multiplication, it must be first of all remarked that as a rule it is far better to buy than to make stock of ericas. But we are bound to suppose the amateur anxious to propagate his choicest varieties, and the best course, perhaps, for him to follow will be to put the ugliest old plant of each sort required into a temperature of 50° in the month of January. The reason for selecting the ugliest plants is that subjecting the plants to heat is bad practice, and handsome specimens deserve better care than to be forced for making cuttings. When the young shoots are three quarters of an inch in length, slip them off with the thumb, and then remove the lower leaves and they will be ready for potting.

Prepare for them five-inch pots with plenty of carefully packed



ERICA VESTITA COCCINEA.



ERICA AITONEANA.



ERICA TORTULIFLORA.

drainage, and a mixture of equal parts peat and sand and half an inch of pure sand on the top. Put into each pot as many cuttings as it will hold and place the pots under hand-glasses in a temperature of 50°, and from the first air them regularly, and after every airing wipe the hand-lights to remove the condensed moisture from the glass. It is a common practice to cover the cutting pots with bell-glasses, but it is injurious, and thousands of cuttings are lost annually from this cause alone. Watering is very important: you must give sufficient to keep the sand and soil always moderately moist, never wet and never dry.

As soon as the cuttings are rooted pot them in smallest 60 size in a mixture of fibry peat and one fourth sand. Pot them firmly and with the greatest care, and immediately shut them up in a cold frame for a fortnight, after which time ventilate them cautiously, and in the course of a fortnight put them out on a bed of coal-ashes and pinch out the point of every one to induce a bushy habit of growth. In September take them to the greenhouse, keep them close to the glass and freely ventilated, and during the winter use no more artificial heat than is necessary to exclude frost or to dispel damp, and permit of air-giving in wet weather. In April shift into five-inch pots and put them into a cold frame. In a month from the shifting put them out on a bed of coal-ashes. Do not stop any of them except for some special reason, for the natural growth is most to be desired. When the growing points of the shoots are nipped out once or twice during the second year's growth, the result is a confusion of the shoots and it is impossible to see the flowers to advantage. When no stoppage is practised, a plant of *E. hyemalis* in a six-inch pot will produce from twenty to thirty strong shoots eighteen inches in height, each of which will form perfect pyramids of bloom at the proper season. It is most injurious to shade the plants during the summer; they ought to be fully exposed to the sun at all times.

In making a selection of heaths, the resident in or near a town should give preference to the free-growing showy sorts, as they suffer but little through exposure to atmospheric impurities, but the slow-growing or very hard-wooded sorts require a pure air and are some degrees more difficult to manage. To ensure success, we must begin with a cool, light, airy span-roof house, or a good pit with piping enough to keep

out frost, but a rougher structure may be turned to equally good account if it is weathertight and airy. The three greatest enemies of ericas are darkness, damp, and artificial heat.

The greenhouse heaths may be divided into two classes—the hard-wooded slow-growing kinds, which are fairly represented by *E. ventricosa*, and the soft-wooded free-growing kinds, equally well represented by *E. hyemalis*. The species and varieties of the first section are mostly summer flowering plants, and those of the second section mostly flower in winter. The general management of both groups is the same, but the particular management differs in accordance with their difference of habit.

The bulk of the hard-wooded kinds flower in May, June, and July, and as soon as they go out of flower they should be taken out of doors and placed in the full sun, on a bed of coal ashes. The soft wooded kinds may be taken out of doors earlier. There must, however, be no haste in taking them into the open air, especially if they are grown in a pit or a house by themselves, or in company with such things as Aphelexis, Hedaromas, and Eriostemons, where they can have a continued circulation of air around them, and full exposure to the light. In wet seasons they should be kept entirely under glass. When kept in-doors through the summer, tilt the lights both at the back and the front if in a pit, and if in a house the front or side lights must be thrown as wide open as possible, and the top ventilators opened when there is no danger of the wet reaching the plants in sufficient quantities to saturate the soil, or wet it deep enough to deceive the cultivator. Otherwise the plants will receive considerable benefit from genial showers. The mechanical operations, such as preparing the soil, potting, and so forth, must be carefully performed, and particular attention must be paid to the provisions for drainage. The peat must be of a tough texture, not at all greasy, free from moss, and if of a bright brown colour all the better. The sand must be sharp and free from lime and iron; the cleanest siliceous grit imaginable. The plants must be potted quite firm and watered with the utmost regularity; if dry for a day or two and then supplied with an extra dose to make up for lost time you will soon be rid of the trouble of keeping them. At every watering the whole body of the soil in the pot should be wetted, and there should be no more given until it is nearly dry again. In case you do find a pot dry and capable of

music when struck with the knuckle, plunge it to the rim in a vessel of water until bubbles cease to rise from it, by which time it will be moistened throughout.

In stopping and training, experienced heath-growers display great dexterity, but the beginner would be wise to permit



EPACRIS MINIATA SPLENDENS.

every plant to assume its own natural form, giving a little aid with sticks and wires to direct the growth symmetrically and carefully, avoiding the slightest distortion or display of the harness employed. The subjoined figures show how widely heaths vary in character and growth, and how nearly impossible it is to improve their contour by any kind of pinching and pruning. The free growing kinds bear the knife the best, and they are as easily spoiled as improved by it.

The Epacris may be grown in the heath-house or pit, and requires nearly the same treatment. The points which demand special mention are the pruning and repotting. The time to prune is immediately after the plants go out of flower, when those that have an erect habit should have the flowering shoots cut back to within a few inches of the old wood, but those with a pendulous habit should be merely shortened into shape. As soon as the new growth is an inch long, repot them and shut them up rather close to promote their establishment in the new soil, and be particularly careful not to give them too much water. It is no uncommon event for the epacris to die after having been repotted, the consequence in one case of being put out in heavy rains, in another of being exposed to a burning sun, and in yet another from being clean forgotten, as camellias often are when put out of doors for the season. If they are put out at all, let it be in a shady damp place, such as the north side of a close hedge or wall, and in a spot where they will frequently "meet the eye" of those who are responsible for their well doing. It is better, however, to keep them in a cold pit all the summer because of the ease with which they can be quickly sheltered from heavy rains. The lax growing kinds are well adapted for training on wire balloons, and they make the loveliest specimen plants an exhibitor can give his mind to. As for training generally, the less of it the better if real beauty is valued at a higher rate than the forms furnished by fashion and formality.

The accompanying figure of *Ceratostema speciosum* will probably amuse the adept in heath growing who may honour these pages with attention. It is a new and extremely beautiful ericaceous plant, a native of Ecuador, where it occurs as an epiphyte. The flowers are vermilion red, tipped with yellow. It requires the same treatment as the Cape heaths.



CERATOSTEMA SPECIOSUM.

CHAPTER XII.

THE CAMELLIA, AZALEA, AND RHODODENDRON.

THESE three noble evergreen shrubs agree well together in the same house, and a few of the hardier kinds of heaths may be grown with them. They differ in their several requirements it is true, and therefore we must appropriate to each a separate paragraph; but the differences are few and small and easily bridged over by careful management. It is so desirable the amateur should experience something in the nature of sympathy for his vegetable pets, that we embrace every opportunity of indicating idiosyncrasies, or say, their constitutional peculiarities, and to these indications, however partial or imperfect they may be, we invite the especial attention of the reader. The three plants now to be considered are so nearly hardy that they may be grown well in an airy house without the aid of artificial heat, but we do not recommend such an extreme procedure. If, however, there is heat sufficient to exclude frost, they will be safer, and will attain to a finer condition both of leafage and bloom than if unaided. They are all characterised by a profuse production of flowers in the winter or early days of spring, followed by a free growth of new wood on which the flower-buds of the next season are formed; and then they take a decided rest, making no more sign of activity than the slow swelling of the flower-buds preparatory to the next display of their glorious colours. They need less air and light than heaths; and camellias are somewhat famed for their enjoyment of old conservatories, the roofs of which consist of heavy rafters and small squares of very dirty glass while the floors are quagmires, and the walls are clothed with the vegetation that belongs to damp and ruin. We must confess that we have seen gigantic camellias covered with flowers "thick as hail," in houses so dirty and dark that it was like visiting one's grave to enter

them, but we have seen them equally thrifty and a deal more comfortable in smart constructions of the present day, which admitted a flood of light from above and presented the temptations of a bright mosaic pavement underfoot to enhance the enjoyment of an inspection of the flowers. In its native land the camellia grows in woods, and hence a certain degree of shade is favorable to its prosperity; but we do not need heavy rafters and a century of dirt to modify the sunlight, because that can be accomplished by some cheap and respectable shading, the employment of which will really add to the comfort of the camellia house when the sun is shining brightly. Camellias, azaleas, and rhododendrons make their new growth quickly, and usually show a bristling of the tender green of the rising shoots before the latest of their flowers have expanded. The appearance of this sprinkling of bright green is a signal to the cultivator that now they require a little extra warmth, and a somewhat humid atmosphere and protection against drying winds and any sudden change of temperature. That they should be carefully supplied with water at this time is of course a matter of some importance. As for that, the watering is a matter of importance at all seasons, though few believe it to be so, for nine tenths of the camellias and azaleas that perish ignobly in private plant houses, are the victims of thirst, as we shall explain presently. Amateurs do not sufficiently keep in mind the great difference between hard and soft wooded plants in respect of ill usage and neglect. We may forget a lot of geraniums and find them half dead in consequence, but if we prune them close and give them a little water, they will soon throw up a forest of new shoots, and in a little while flower again and look as buxom as ever. But if we forget our heaths and camellias and azaleas, it is no such easy work to restore them, and the very first step taken towards their restoration may result in making an end of them completely.

THE CAMELLIA JAPONICA is well adapted for the winter garden, and is in the most proper sense of the term a "conservatory plant." To do it complete justice it should not be associated with other plants, and hence the right way to enjoy it is to provide a camellia house. If a house is built expressly for camellias, it need not be so fully lighted as for quick-growing, soft-wooded plants; and those who grow

camellias in houses that admit of full daylight, must adopt some effectual method of screening them from the sun from the 1st of March to the 1st of September. Hartley's rough plate will be found invaluable for the top lights of a house in which camellias are to be grown, as this excludes sunshine, yet admits the ordinary daylight without interruption. As a rule a lean-to is preferable to a span-house for camellias, and if there is no method of shading adopted in the original plan of the structure, the roof must be furnished with a roller blind, or tiffany must be put up in loose bag-like folds, thus—



Or the inelegant plan of smearing the glass with size and whitening must be adopted. This last is a rough and ready way of shading which costs nothing beyond the time of preparing it, and is very effectual. Our camellia house is in rather too sunny a situation, and we have rendered the employment of temporary shading unnecessary by stippling the glass lightly with pale green-coloured paint.

The camellia house need not be very freely ventilated; during the early period of the year they do not need much air, and though they can scarcely have too much during summer and autumn, ventilators and doors may then be left open night and day, or the plants may be set outside to ripen the wood and perfect the flower-buds. Old greenhouses that are dark and defective of ventilation, and therefore unsuitable for such plants as the erica and epacris, may be made good use of for the culture of camellias. Though camellias may be grown in unheated structures, it is far preferable to heat the house with hot-water pipes or a tank, so as to be able to raise the temperature to 60° during the severest frost, as we sometimes have the coldest weather of the whole year just as the first batch of camellias is coming into bloom and in any case there should be the means of keeping out frost, which is never a benefit to the plants, though they can bear half a dozen degrees with impunity if the wood is ripe.

We prefer to keep camellias under glass the whole year round, and feel inclined to pronounce vigorously against putting

them out of doors at all. But if it were imperative to keep them always under glass, many persons having but limited glass room would have to give them up altogether, and the



CAMELLIA JAPONICA.
Imbricated show flower, one third less than natural size.

plan of removing them to the open air is a very good compromise between the best and worst methods of treatment. Take them in doors the last week in September. If the house *is still otherwise* occupied put them in pits or frames, so that

in some way or other there is glass over them. All they need for some time is to be kept regularly watered, never wet and never dry, safe from frost, but not to be stimulated by heat till it is required to push them into bloom.

As the flowering season approaches it is necessary to clean the foliage. However clean it may appear, we prefer to set a lad to work to sponge every leaf with tepid water; it is astonishing how exquisitely bright and green the leaves look after the process. As they are washed set them aside and remove a little of the top soil in the pots, not more than an inch, and supply its place with two inches of rotten manure and leaf-mould well chopped over. Remove the plants into a house where they will have a temperature of 45° by night and 55° by day. After they have been there a week, raise the temperature to 50° by night and 60° to 65° by day, and make it a rule never to flower a camellia in a higher temperature than 65°. As the flowers open remove them to a house a few degrees cooler, or lower the temperature of the house they are in about 5°, which will prolong their beauty and *prevent them growing too soon*, for they cannot grow and bloom properly at one and the same time.

Camellias will grow tolerably well in peat and sand if carefully looked after, but nothing is so good as turfy hazelly loam, mixed with a fifth part of leaf-mould, or thoroughly decayed hotbed manure and an equal proportion of sharp sand. When potting them, press the soil firmly round the ball, for if it is put in loosely the water will run through it, and leave the ball wherein the roots are perfectly dry, and the latter will perish accordingly. To give a general rule for the size of the new pot, we can only say that it should not exceed two sizes larger than the one the plant is taken from. When large camellias are shifted into tubs, it is a good plan to put a ring of clay on the surface of the soil in the tub to mark as nearly as possible the line of junction of the old soil and the new. The water should be poured within this circle, so as to wet the roots of the plant and keep the new soil as nearly dry as possible. When a year has elapsed remove the ring of clay and allow the water to penetrate the whole body of the soil, as by that time the roots will have pushed into the new stuff, and increased vigour of the growth above will show that the ring of clay contributed in a material degree to the success of the tubbing.



CAMELLIA PLANTED OUT WITH ARRANGEMENTS FOR AERATING THE ROOTS.

When camellias become sickly a portion of the old soil should be removed, and the plants repotted in the same sized pot again, filling in with fresh soil. If it can be managed, the pots should be partially plunged in a bottom-heat of 70°. The best time for shifting healthy plants into larger pots is just after they have completed their growth, and a few weeks before they are placed out of doors. They must not be disturbed materially at the roots, or a large portion of the buds will probably drop off. Weakly plants, or those that are leggy and require cutting back, should be taken in hand just as the young growth begins to push. After the branches are pruned in, the plants should be frequently syringed, and then, when the young growth is about half an inch in length, the plants should be repotted, much of the old soil being removed from the roots. After this, they should be kept close until the young roots begin to take hold of the fresh soil. After a gradual hardening off, they can be turned out of doors for the summer, along with the others. All the plants ought to be examined every spring, and any shoots inclined to grow straggling cut in. By this simple method they are always handsomely shaped, without the harsh necessity of a grand cutting back every three or four years, which can only be done at the expense of a season's bloom. After the flowers are over in the spring, a moderate syringing overhead will keep the foliage fresh and clean.

The most common complaint of the amateur camellia grower is, that just when the plants should be coming into flower the buds drop unopened and the work of a season is lost. The beginner must be prepared for this; and moreover, must be prepared to be told that the shedding of the buds is due to mismanagement. Between the completion of the new growth and the opening of the flowers, camellias are, we say, "at rest." The term is perhaps misleading, for to the uninitiated it conveys the idea that neglect will do no harm, and hence it happens that, in the later days of summer, camellias are allowed to go dust dry. It may be that sufficient rain occurs to wet the surface of the soil for a couple of inches in depth, no trouble being taken to examine and sound each individual pot, to ascertain if the soil is wet quite through. The leaves, from their leathery texture, show no signs of the suffering the plants are undergoing until matters become desperate. If the watering-can comes to their relief before the

leaves flag, it is thought that no injury is done; vain delusion! for in a month or two, the buds fall off wholesale, and no end of wonder is excited as to the cause, for the plants may then be in the most favorable condition with respect to moisture at the roots.

Before they are put out of doors they should be freely exposed to the air. A shady position, away from the drip of trees, should be selected for their quarters, and each pot stood upon a couple of bricks, to prevent worms getting in through the bottom. The plants should be regularly looked over and watered when required, but without over-doing it, for it is quite as easy to ruin their health with too much water as it is by drying them up.

The principal points in camellia growing are to pot them in sound fibry soil, to have the drainage perfect, to afford sufficient moisture at the roots without any excess, and to avoid all sudden changes and checks. When the pots are full of roots, and it is not considered desirable to repot the plants, a watering with weak manure water will be of immense assistance to them.

We have said nothing thus far, as to the desirability of planting camellias in open borders, but that is the right way to furnish a camellia house. Prepare well-drained borders or stations with a foot depth of rough material, such as broken bricks or tiles and two feet depth of good hazel loam full of fibre chopped up to the size of a man's fist and mixed with a sixth part of old bricks broken to the same size. In such a border camellias will grow grandly if the atmospheric conditions are right. The subjoined rough sketch shows how camellias are planted in the house of a cultivator who supplies Covent Garden Market with the double white camellias from October to February. The border is prepared as above described, but in making it a number of two inch drain-pipes are inserted round the station for every tree. The result is that air is admitted to the rubble and finds its way to the roots, and while the plants benefit by the access of this necessity of life, the soil is kept sweet and may be flooded with water occasionally without any fear of undesirable results.

To propagate camellias is strictly a nursery business, and our advice to the amateur is not to think about it. But a few words on the subject will be consistent with the purposes of this work. Camellias are multiplied by seeds, cuttings, and

grafts; seeds should be sown in well drained seedpans filled with a mixture of equal parts peat, leaf-mould, and silver sand. Cover them an inch deep and pack them away in a moist warm place and never allow them to get quite dry. They will be two years in germinating and it is no use to endeavour to hasten the process by artificial heat. Cuttings are to be prepared from the wood of the season when nearly ripe and every joint will make a plant if the leaf is not removed. Insert them firmly in sand and keep them cool and slightly moist for three weeks, then put them in a moist heat of 70° and they will soon make roots and must be potted



INARCHING THE CAMELLIA.

off in sandy peat and kept growing in a temperature of 50° to 60° the first winter. The easiest mode of propagating is grafting by approach, or, as it is more commonly called "inarching."

This may be performed during summer or autumn, after the wood is ripe, or early in the spring before the plants begin to grow. We prefer the spring, because there is then a long season of natural heat to perfect the union, and the scions may be sooner cut from the parent plants.

Place side by side the two plants that are to be operated

on. The stock is not to be beheaded until after the graft has grown, and both stock and scion should be in a state of vigorous health. Select on the named variety a branch that may be easily drawn aside and bound to the stock, and mark where they can be made to meet easily without straining either. Pare away with a sharp knife about two inches' length of bark on both stock and graft where they meet, and sufficiently deep into the wood of each, so as to bring the edges of the bark of each into close contact, but beware of cutting too deeply into the wood. Make a small tongue upwards in the scion, and downwards in the stock, as in side grafting; fit the parts together and tie with bast. There need be no claying



or waxing, for if the operation is performed in a house suitably warm and moist, junction will soon take place. The appearance of the plants operated upon will be as in the subjoined cut; of course one bushy plant of a chosen variety may be surrounded with stocks, and supply scions for them all by a little management. In about nine weeks from the time of the operation the scions may be separated from the parent plants, and the bast removed. In cases where the plants cannot be brought into contact, the scions must be cut off the plant to be propagated. The inarching is to be performed in precisely the same manner as first described, and the end of the scion must be inserted in a phial of water suspended to some part *of the* stock as in the second figure.

THE AZALEA INDICA requires, speaking generally, the same treatment as the camellia, but instead of a loamy should have a peaty soil. As it is an easy matter to propagate them we shall begin with that part of the subject. It is an easy matter to procure seed, as the single varieties produce plenty. Sow as soon as ripe in pans of sandy peat and keep in a moist heat until started. Cuttings should be made from the shoots of the season when nearly but not quite ripe. The new varieties are generally sent out grafted on seedling stocks. The last method is a very simple affair of crown or cleft grafting, easily learnt and requiring only a little practice to make perfect in it. However, we recommend the amateur to obtain ready made nursery plants, for azaleas are never needed in such quantities in a private garden, as to render the propagating of the varieties worth the acquisition of the "knack" which is the key to success.

The best time to buy is in the spring. When the plants come home examine them well, as it is possible they may be infected with thrip, the sign of which is a sooty deposit on the under sides of the leaves. If they appear to be thrippy, shut them up and give them two doses of tobacco smoke, not only to cleanse them but to prevent the spread of the destructive pest. When the plants have flowered and begin to grow, put them in pots one or two sizes larger. The compost usually employed is one consisting of peat five parts, and one part sand, but we prefer equal proportions of silky yellow loam full of the roots of grass and tough fibrous peat, with a sixth part of the whole bulk of silver sand.

Azaleas are strictly greenhouse plants, but they receive immense benefit from the assistance of a genial temperature when making their growth in the spring. When the stock is fresh potted, place it in a temperature of about 65°, and maintain a healthy atmosphere by frequently sprinkling the paths and stages; also syringe overhead lightly morning and afternoon. Water sparingly, because the roots are too much deranged to take up a large supply; and, to keep up the balance, the evaporation must be checked in the manner pointed out above. Hundreds of azaleas are killed annually through improper watering, for they are remarkably impatient of being tampered with at the roots. It is a very common practice to give just sufficient to wet the soil to a depth of three or four inches below the surface, without troubling to



AZALEA VARIEGATA SUPERBA.

ascertain whether the lower portion is wetted or not. When once the lower part of the ball gets dust-dry, it is no easy task to moisten it without dipping it into a vessel of water. When any plant looks sickly, or evinces any flaccidity in the leaves, and the soil is moist on the top, turn it out of the pot, and probably the soil will be found dust-dry at a few inches from the surface. The water should always run through the hole in the bottom of the pot after its application, and you should continue to fill up the space on the surface until it does. Guard against giving too much water at the roots, for that is as injurious as an insufficient supply.

Give liberal ventilation as soon as the stock has recovered from the check received in repotting, and increase it as the growth progresses. Although a moist and warm atmosphere is essential to a healthy growth, it must not be kept too close, or the shoots will be weak and long-jointed. When the growth is completed, harden off by opening the ventilators night and day, and then place out of doors, in a shady and rather sheltered position, until the middle or end of September. A light, airy greenhouse, with a temperature of 40° or 45°, is all that is required during the winter months; and give the treatment already advised during the following spring and summer. Good specimens can be, and are, grown without a taste of artificial heat, excepting what is necessary to keep the frost out; but to grow them like the magnificent specimens staged at the metropolitan exhibitions, the preceding directions must be strictly followed.

When a nine-inch pot is reached, a shift once in two years will be quite often enough, unless large specimens are required at the earliest moment possible. Extra care will be requisite in watering during the second year, to prevent them suffering from drought, without them being kept too wet. Water with rain-water at all times, except when they are making new growth the second year after a shift, and then water with weak liquid manure, made by steeping sheep- or cow-manure in rain-water, and allowing a sufficient time to settle before using. It should be diluted with soft-water until paler than pale ale.

With regard to training the specimens into shape the pyramidal form is perhaps the best. Those who intend to train should take them in hand in a young state, for it is a difficult affair to get an old plant into shape after being allowed to grow wild for several years.

The single and double azaleas are grown in precisely the same manner, and in any case the double varieties should, on account of their fine characters, have a conspicuous place in even a small collection.

THE RHODODENDRON. — From this fine genus we may select a number of tender species and hybrids that are as well worthy of culture under glass as the hardier kinds are in the open air. The glorious *R. arboreum* with its myriads of scarlet flowers is perhaps best known as the representative of this class, but a good selection would include the wonderful *R. Nuttalii*, the chaste and fragrant *R. Edgworthii*, and the curious *R. Jasminiflorum*. The routine and cultivation advised for azaleas will suit rhododendrons, and their place should be in the coolest part of the house.



CHAPTER XIII.

GREENHOUSE AND CONSERVATORY CLIMBERS.

INCIDENTALLY a few trailing and climbing plants have been already treated of, but it is time we gave them a little attention as constituting a distinct class, possessing certain characteristics in common. And it may be proper in the first place to remark upon their importance as elements in the furniture of a plant-house. It is simply impossible without their aid to produce the rich effect of a covered garden which we look for in a conservatory, and the lack of which fills us with a sense of coldness and opportunity wasted. It matters not how well the borders, stages, and other parts near the ground line of the structure, may be furnished, the eye will travel upwards, and if pillars and roof are alike unclothed, the feeling that there is something wanting will be painful. On the other hand, a judicious selection of twining and climbing plants will not only fill up a void, but present forms of beauty distinct in many respects from those that characterise the plants of the ground line. The lovely tracery of a tacsonia or lapageria seen against the sky as the plant follows the lines of the roof is a feature of the highest value, and the necessity for it increases with every advance in the dimensions and pretensions of the conservatory requiring to be furnished.

Coming to practical matters we are bound to say that small plant houses devoted chiefly to working purposes should not be cumbered with climbing plants at all. If they thrive they will be in the way, and will impede the light, but as they must be grown in pots, the probability is that they will not thrive, and that is a fatal reason for avoiding them. Having blown hot and cold with the same breath, we proceed to remark that as a rule, climbers should always be planted in borders or not at all, but we feel bound to admit that we have grown many fine examples of first rate plants of this class and have seen

the same accomplished by others often enough to make exceptions to *dis*prove the rule. Nevertheless, we pronounce the rule good, and hope the reader will be cautious in disregarding it, for above all things we do wish this little book to prove a preventive of vexations as well as a guide to the production and enjoyment of delights. If climbing plants do not grow vigorously and to a certain extent naturally, they soon become the prey of all sorts of vermin and in all likelihood will never flower at all.

If a border cannot be provided, boxes of wood, slate, or stone will be found useful as cheap and servicable substitutes. The boxes should measure a yard every way, to contain a cubic yard of soil at the very least, but they may be two feet instead of three feet deep and they may be only one foot wide. If the measurement is curtailed in one way it must be enlarged in another, and in any case there must be a depth of at least two feet of soil, or no strong growing plant will thrive in it. In making a border, the size and arrangement of the house must in some degree determine the order of operations. Most conservatories have a three-feet table round the sides, and underneath this table the border must be made; and here arise the principal difficulties that have to be contended with in dealing with houses that were erected without any reference to the manner in which they were to be furnished. The border should be three feet wide and four deep to grow the plants in a satisfactory manner. Now, if we go down to that depth, a hundred chances to one we shall let the walls in, and the pipes are generally above ground, under the side table, which prevents us running a four-inch wall up to within a few inches of it. In cases of this description, the boxes have to be put into use, and on the top of the table. To prevent their looking unsightly, a few shoots of the plants that are growing in them should be neatly trained over the sides.

The borders, as already explained, should be about three feet wide by four deep, but a few inches either way is of no material consequence. In the bottom of the trench or border should be placed twelve inches of broken brickbats for drainage, and over this bed should be laid fresh turves, grass-side downwards. For filling in the border, nothing beats a compost consisting of three parts good turfy loam, and a part each of decayed leaf-mould and manure. The loam should be obtained *from the top spit of* pasture or common land, and be full of

fibre, and chopped up into pieces the size of one's fist. Common garden soil is quite useless for this purpose, as no plant will thrive in it. To induce the plants to root quickly in the new soil, a little river sand may be mixed with the soil at the spot where the plants are to go, for the free-growing kinds, and silver sand for the slow-growing and choicer kinds. The plants should be managed so that they do not interfere much with the light required for the well-being of the subjects underneath; and, though the beauty of this class of plants consists in their being allowed to grow in a seemingly natural manner, they must not be left to themselves, or they will soon run wild and get unsightly; therefore they must have frequent attention in the way of stopping and training, and those on the roof must be cut hard back in the autumn to admit plenty of light. Those on the walls and pillars can be pruned at any season of the year, so long as they are kept neat and trim. Generally speaking, from October to March is the best time for pruning them. We often hear objections made to employing climbers on account of their shading the house too much, but the objection is untenable. In the summer all plants are benefited by a partial shade; and what can be more suitable than a green canopy of foliage, from which numberless flowers hang about in graceful profusion. In the winter when shade is really objectionable, the summer growth can be cut away.

We have thus far spoken as if we were thinking of climbing and twining plants only, but we must include in our selection a few that have no climbing propensities or means of taking hold of support, because of their suitability to the walls and pillars, and generally speaking to improve the aerial perspective. The very first on the list is of this category.

ABUTILON.—The plants belonging to this genus have large handsome foliage, with beautifully marked bell-shaped flowers, the prevailing colours being orange, striped and veined with various shades of red and crimson. *A. striatum* and *A. vexillarum* are the two best species for covering walls. Both do well planted out in the summer, in a sheltered position, and are propagated by seed or cuttings of half ripened side-shoots in the summer. They should be carefully pruned, so as to keep them well furnished from bottom to top.

ACACIA.—We have several species in this genus that do

well trained up pillars and walls, their feathery foliage giving the house a peculiar light and elegant appearance. In addition to the beauty of the foliage, they flower with the greatest abundance in the spring, loading the atmosphere with the most grateful odour. Young plants are readily raised from seed. *A. affinis*, *A. dealbata*, *A. pubescens*, *A. Riceana*, are four good species.

BIGNONIA.—*B. Cherere*, *B. jasminoides*, *B. venusta*, and *B. grandiflora* are all good. The first and last are strong growers, and most suitable for large structures. The first produces large bunches of scarlet and orange flowers; the second has neat, dark, glossy green foliage, with white flowers, and will do for any-sized house. To promote flowering keep the wood thinned out, and keep them rather dry at the roots through September and October. They will flower freely if the wood is properly ripened, and both the above-mentioned proceedings materially aid that necessary process. The stubby side-shoots when about half ripe strike freely.

CLEMATIS.—There are so many beautiful species and varieties of the Virgin's Bower, that it is rather a difficult matter to know where to begin, when making a selection. They are mostly hardy, and are unequalled for covering trellises either in doors or out. They are easily increased by cuttings or layers; the last-mentioned way is the surest to adopt by those who know very little about propagating matters. July is the best time for performing the operation. For flowering in May and June select *Azurea grandiflora*, deep purple; *Standishi*, violet-blue; *Fortunei*, large double white; and *John Gould Veitch*. These must be pruned very hard in the winter, as they flower from the old wood through May and June. For flowering after the above, the undermentioned are particularly good:—*Jackmanni*, violet-purple; *Rubra-violacea*, maroon shaded with violet; *Rubella*, rich velvety claret; *Lanuginosa*, pale blue, very large; *Lanuginosa candida*. These bloom on the young wood, and should be pruned back to about four buds in November.

COBÆA.—*C. scandens* and *C. scandens variegata* are invaluable for covering quickly large spaces, but with judicious management are equally good for small houses. *C. penduliflora* is a curiosity

and remarkably elegant when in flower. The side-branches should be pruned back to a couple of eyes, and the young



COBÆA PENDULIFLORA.

shoots, if they are allowed to grow without stopping, will flower freely. When they are kept constantly pinched back through the summer there is little else besides wood. All the growths that are not required should be removed altogether. Propagation by either cuttings or seeds. The plants require plenty of water when growing freely through the summer.

FUCHSIA.—The robust habited fuchsias are wonderful pillar plants when trained up from twelve to twenty feet, and fur-

nished with healthy shoots from the bottom to the top and nicely in flower. When first planted they should have as much attention and skill employed upon them as is brought to bear upon growing specimens for exhibition, and unless this is done in the first instance, it is a difficult matter to make them first-rate afterwards. If planted out in light rich soil, and regularly stopped and trained until they get into shape, they will be superior to the best pot-plants ever grown in this country.

GOMPHOLOBIUM.—*G. polymorphum splendens* is a pretty neat little thing for choice spots, and where it can get plenty of light and air. It should be grown in peat mixed with a little fibry loam and plenty of silver sand. As it is rather a delicate-rooted plant, water must be applied carefully, so that it does not get too much or too little. Unless it can be placed in a position where it can have the proper treatment, one of the stronger-growing plants had bettter be employed.

HABROTHAMNUS.—*H. elegans* and *H. fasciculatus* are both admirable subjects for walls and pillars, but best for the latter, and especially useful for supplying an abundance of cut flowers for the bouquet and table. The flowers are rosy crimson, and of good substance, and last fresh and good for some time after being cut. The side-branches should be cut back to a couple of eyes in much the same manner as a grape vine. Red-spider is partial to it, therefore it should not suffer for want of water at the roots, and a good syringing now and then will help to keep these abominable pests in subjection.

HOYA.—*H. carnosa* and *H. carnosa variegata* are both valuable plants for training over the roof. They are vigorous growers, with compact massive-looking foliage. The flowers show better when the plants are trained overhead. Plenty of water in the summer, and rather dry when at rest, are the chief points to consider. Mix a little peat and plenty of crocks broken small with the soil. A branch laid in a 6-in. pot will soon root and make a plant. In a cool house the Hoya is of no use at all.

JASMINUM.—*J. azoricum* and *J. grandiflorum* are both highly fragrant, and the latter has the additional qualification of

flowering in the winter, and is invaluable for cutting for bouquets.

KENNEDYA.—We can dip deeply into this beautiful genus, for all are more or less good, so far as regards the beauty of the flowers and neatness of foliage. But they have the bad quality of soon becoming smothered with the small white scale, and it is utterly impossible to keep them clean after they are once infested. The soil should be composed of loam and peat in equal quantities, with plenty of drainage. *K. coccinea major*, *K. inophylla floribunda*, *K. monophylla*, and its beautiful varieties, *alba* and *rosea*, *K. rubicunda*, one of the best for covering large spaces quickly—all are good, either for roof or walls. As most of those enumerated are tender rooted, due care must be paid to the watering at all times and seasons, more particularly through the winter. The Kennedyas will strike readily from cuttings in the hands of a skilful propagator, but the best plan for those who have not had much practice will be to sow seeds, which can be readily obtained of most species. The seeds should be soaked in water several hours before sowing.

LAPAGERIA.—*L. rosea* and *L. alba* are grand when well done. As the flowers droop beneath the foliage, they are just what we want for the roof. Nothing can surpass the beauty of their lovely pendent blossoms. The drainage should be first-rate, as it requires an abundant supply of water when growing. The soil should consist of good fibrous peat, mixed with a little loam and plenty of sand. The plants will receive an immense amount of benefit from a partial shade in hot weather.

MANDEVILLEA.—*M. suaveolens* is fine for warm greenhouses. and moreover valuable for cutting. Its delicate white flowers being highly fragrant, are very popular for hand bouquets. Best for pillars and walls.

MAURANDYA.—There are three pretty varieties that will suit any greenhouse, namely *M. alba*, *M. Barclayana*, and *M. kermesina*. They are extremely neat in growth and answer admirably for light trellises, balustrades, and baskets.

MUTISIA.—This is a really hardy genus of composite plants. The best are *M. clematis* and *M. decurrens*. The large orange

coloured star-like flowers of the latter are distinct and dashing, and the plant requires the least attention of any climber known.

MYRSIPHYLLUM.—A remarkably elegant genus of delicate



MYRSIPHYLLUM ASPARAGOIDES.

twiners. They require sandy peat or very mellow loam and leaf mould, with plenty of sand. *M. asparagoides* is the best.

PASSIFLORA.—Here is another genus from which we can make an almost unlimited selection of good kinds, for pick where we will we shall not find any really bad. Like everything else, some are better than others. We want the best, and the following selection cannot well be improved upon for the greenhouse: *P. Cærulea*, *P. Colvilli*, *P. hybrida floribunda*, *P. Loudoniana*, *P. Cincinnati*, and *P. racemosa purpurea*. All the young growth not required should be cut away, and the other shoots allowed to grow to their full length, to induce them to produce plenty of flowers. When all the shoots are

allowed to grow together, and then kept pinched back continuously, as is often done, very few flowers may be expected. In the winter they should be pruned back to a couple of eyes, and



PASSIFLORA CINCINNATA.

when they break, if both shoots are not wanted, rub one off. A little management of this description will save a world of trouble when they are in full growth.

PLEROMAS.—The best place for pleromas is an *intermediate house*. The soil should be composed of equal parts of good peat, silky loam, and leaf-mould, and a half part each small potsherds and sharp sand. In the earlier stages of growth a larger proportion of sand should be used. During

winter water must be given with great care, the roots being kept rather dry; in summer, when the plants are growing freely, water must be supplied in plenty. The best of the pleromas for the warm greenhouse is *P. sarmentosa*, which makes a nice specimen plant in a pot if trained to a wire balloon. The flowers are of a fine violet colour, shading into blue.



TACSONIA ERIANTHA.

PLUMBAGO.—The fast growing blue-flowered *P. capensis* is a good pillar plant and will supply useful flowers for bouquets. Cuttings of young wood strike as freely as fuchsias. When growing freely it should be frequently syringed.

SOLANUM.—The well known *S. jasminoides* may be employed to clothe either walls, pillars, or roof. Plant in the border and keep well watered in summer. It may be easily increased by means of cuttings.

TACSONIA.—The species with which this interesting genus is made up are eminently beautiful, but only adapted for large houses. They are strong growers, and unless they can ramble about freely, very few flowers will be the result. Treat them as advised for the Passifloras. The best for the greenhouse are *T. Buchanani*, *T. Van Volxemi*, and *T. eriantha*.

VITIS.—The grape-vine is a princely plant for a greenhouse roof, and one of the easiest to grow and to render fruitful. If a



VITIS HETEROPHYLLA.

curiosity in the way of a vine be wanted, you may plant the blue-berried *Vitis heterophylla*, or the parsley-leaved *V. vinifera apiifolia*.

CHAPTER XIV.

THE ORANGE, LEMON, AND LIME.

It is a favourite and commendable pastime to raise orange and lemon trees from seeds; and lady gardeners acquire considerable expertness in it; although it is a most rare event for them to meet with the encouragement they deserve and look for in the production of fruit by their seedling trees. The question is often asked of horticultural advisers if the trees should be grafted to render them fruitful, and it is but proper we should anticipate the question here. Any member of the *citrus* family, whether citron, shaddock, orange, lemon, or lime, may be raised from seeds with the greatest ease, and every seedling plant will become fruitful when of a proper age to produce fruit, provided it has the advantage of proper management. As a matter of course, a large proportion of the pretty little seedlings we meet with in ladies' plant houses and window gardens are not properly managed, and are not likely to live to a fruit producing age. Having had many opportunities of observing the process of this particular phase of orange culture, we must confess that it is to us a matter of surprise that the seeds germinate and the plants live for some years, for as a rule, all the conditions appear to be against them. They are generally potted in black mud, low down in the pots, as if mud were a scarce article; they are watered and ventilated by accident rather than by system, and their tenacity of life affords a delightful proof of the accommodating spirit of the citrus tribe, which have this good quality at least, that they love life too well to be easily pushed out of it. We repeat that every seedling citrus will produce fruit some day if you only wait long enough and manage the plants properly. But then, it will be asked, for what purpose are they grafted? There are two purposes secured by grafting. The process hastens fruit production, and it ensures fruit of the same

quality as that of the tree from which the graft was taken, provided of course that the routine of cultivation is what it ought to be. In all cases of grafting the object is chiefly to ensure that the fruit shall be of good quality, but as the process promotes early fruitfulness, there are two good reasons in favour of it.

There is not a tree or shrub in the garden more worthy of the care required for its perfect development than is the orange. Its fragrant flowers produced in profusion during winter and spring amply repay the care bestowed upon it, but the fruit that follows makes a still further return—a sort of cent. per cent. upon the outlay, whether of money, skill or patience, or of all these requisites combined.

All the citrus tribe are shade-loving plants and must therefore be protected from the full glare of the sunlight in high summer, but throughout the winter they should have all the daylight that can be secured for them. To shut them up in dark houses is a mistake; and it is one of the wonders of modern horticulture that until quite recently orange trees were shut up in dark houses in all great establishments, and were so much injured in consequence that they might as well have been shut up altogether and forgotten for ever. Another peculiarity of the family is that it will not endure extremes of heat or cold, and hence, if orange trees are allowed to freeze in winter and roast in summer, they become, if they are not killed, unhealthy and unproductive, and more plague than profit to keep them. The shaddock and the lime are the hardiest of the family and may be grown with the aid of a glass wall and without artificial heat in the most favoured districts of the south of England and the Isle of Wight. As a rule the lowest temperature that orange trees should be subjected to in winter is 45°, but the average winter temperature should be 50° at least, but in summer a good greenhouse temperature is quite sufficient.

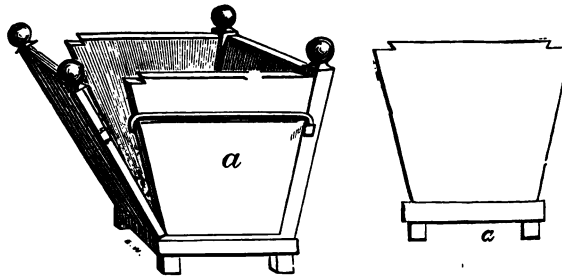
The Orange and the Lemon have higher claims on the English amateur than any others of the family. To do them perfect justice they should be planted out and never be pruned except to keep them somewhat shapely and within bounds. When enjoying fair root room in a wide border with plenty of moisture above and below, they are proof against all pests and all diseases, and it is a question of temperature solely whether they produce their proper quantity of flowers and

fruit. But there are many who must grow them in pots or tubs, and our advice on this part of the subject is that the management should be characterised by liberality, for potted orange trees are usually ghostly things, the victims of some sort of starvation.

The compost required for potting purposes is one consisting of four parts of rich turfy loam to one part each of thoroughly decayed manure, leaf mould, turfy peat, and sharp sand. The siftings of the sweepings of a gravel walk are preferable to sand if clean, but if containing many fragments of dead twigs may prove injurious by promoting growth of fungus on the roots of the orange trees. The drainage should be perfect, and the soil should be well rammed in to render it firm about the roots. Empty flower pots or pans may be advantageously employed to assist the drainage of large pots and tubs, for if the surplus water does not readily escape, the trees will soon become unhealthy. The potting should be finished with a layer of fat manure on the surface.

Regular and plentiful watering is a matter of the greatest importance. It is not sufficient to give so much water at such and such a time, but the cultivator must ensure that the whole body of the soil is moistened. If a tree that has long stood in the same tub appears to be languishing it may be desirable to probe the soil with a crowbar to ascertain if it is moist within, for it is likely enough that the water all runs away and leaves the tree, like Tantalus, dying of thirst in the midst of plenty. If it be found that the interior of the ball is dry, several holes should be bored in it with the iron bar and several copious waterings should be given, and as soon as the ball is well wetted, weak manure water should be supplied for the remainder of the season, and then the plant should be re-tubbed and as much as possible of the old soil removed from the roots in the operation.

The best boxes for orange trees are those made of slate with movable sides as in the subjoined figures. The rapid decay of wood and its tendency to produce fungus are serious objections to its use. The slate boxes are not only imperishable but incapable of producing fungus. However, boxes of wood made to the same pattern may be preserved in sound condition for many years by the use of paint without and pitch within, and the removal of the sides (*a*) is easily effected by merely *lifting the side bars* which brace them together.



It is remarked above that to do complete justice to the orange and the lemon they must be planted out in a good border in a well managed conservatory. We are tempted to add that to do perfect justice to them they should be grown in houses devoted to them alone, and we may as well add further that an amateur desirous of a special and very choice hobby in the way of plant growing, could hardly find a more attractive subject than the orange when provided with a proper house and cultivated with earnestness. As a winter garden, a well managed orange-house would be quite unique, and the very fact that it would have to be kept cool and airy all the summer would render it an agreeable place of resort even then, when covered gardens are least cared about. For general purposes the common orange is the best for the amateur cultivator, but in an orange-house we should of course require a collection of varieties, and the St. Michael's and Tangerine would probably be most prized amongst them.

All the insect plagues that ever were known appear to have a liking for the orange. The black deposit we frequently find on the leaves is a sure sign that thrips or scale have secured a lodgment. To get rid of this sooty pollution syringe the trees well and then wipe the leaves on both sides with a dry sponge, which must be frequently washed and squeezed dry as the work proceeds. It is a tedious business, but it must be done. If scale and meally bug obtain a decided lodgment it will be necessary to sponge the trees with warm strong soapsuds. If green fly appears smoking must be resorted to. While, however, you are removing the vermin, you must promote the health of the trees by good management, for in almost every case the appearance of any insects upon them may be re-

garded as evidence that they are starving. Trees in pots and tubs are always liable to attack, but trees planted out rarely want any doctoring if they are but fairly treated as to moisture, temperature and light.



ARALIA VEITCHII.

CHAPTER XV.

HARD-LEAVED PLANTS.

THE plants that claim attention in this chapter have for several years past been rising in popular estimation, but as yet are not sufficiently understood as to their management, or appreciated as to their beauties. Being for the most part quiet in colour and slow in growth, they do not readily obtain a hold on the affections of amateurs, and only such as are amateurs indeed, and influenced by peculiar tastes, will ever become permanently interested in them. Their claims on our attention are many and strong. The more distinctive of them are strikingly tropical in aspect and present us with a majestic and masculine order of beauty. They are long lived, robust habited, and bear ill treatment as patiently as any plants known to cultivation. But ill treatment will not develope their proper characters, and the best treatment is of so simple a nature that it would be a shame anywhere and anyhow if a collection of these noble plants should be allowed to fall into decline through neglect or mismanagement.

The plants we have in view as "hard leaved" are Agaves, Beaucarneas, Dasylirions, Dracænas, Fourcroyas, Hechtias, Palms, and Yuccas. For the cool conservatory there is ample room for selection amongst these plants, but the amateur must be careful not to purchase for the cool house any species that require intermediate or stove temperature, for this mistake may be easily made in the case of palms and dracænas, some of the noblest of which are decidedly tender in constitution. A few notes on the cultivation of the several sections of this group will suffice for all practical purposes.

AGAVES are usually classed with succulent plants, but this appears to us to be the proper place for them. The so-called "American aloe," *A. Americana*, is the representative of the family, the members of which differ considerably in their

pictorial features. The *Variegated* American agave is a noble conservatory and terrace plant. *A. applanata*, *A. horrida*, *A. filifera*, *A. ensiformis*, and *A. schidigera* are distinct and fine. Agaves are usually starved out of character owing to the prevailing notion that they can live on sunshine alone. Of light indeed they must have plenty, but they must also have a good body of soil to root in, and during the growing season plenty of water. A mixture consisting of turfy loam three parts, and one part each of sharp grit and leaf mould will suit them all, and the drainage must be perfect. If they can be allowed to make the whole of their growth in the open air, say from the first of June to the first of September, they will be the handsomer and healthier for it, but they will do very well under glass all the summer if allowed plenty of light and air. During winter they should be kept quite dry and have enough heat to secure them against frost. If by any accident the leaves are wetted in winter raise the temperature of the house to dry off the moisture, for if it is allowed to lodge for any length of time black spots will result and these will in time become ugly holes. Propagation is easily effected by means of suckers. Young plants must have regular shifts to promote growth, but large specimens may be kept in the same pots or tubs for several years. If pots sufficiently large can be obtained they are to be preferred to tubs, and it will be well to remember that overpotting is no advantage, and the size of the pot, may, as a rule, be determined by its ability to carry the plant without toppling over. Large plants should be repotted every three years at least, and the simplest way to do is to tie the plant carefully and securely and then to cut it through just above the roots and then plant the top with its short stump in a well prepared pot of fresh soil one or two sizes smaller than the pot or tub it was taken out of. If this is done in the early part of June, the plant may be put out of doors in a sunny place, and will make new roots directly and be well established in the new pot long before winter. The next year it may be shifted into a pot one size larger: the next year it need not be shifted and the next it may be shifted again, and it may be cut off as before and potted in a comparatively small pot.

The flowering of an agave is an important event, and one may wait so long for it that "they say" it flowers only once in a hundred years. This is a fiction founded on fact. In



AGAVE SCHIDIGERA.

some cases the flowering results in the death of the plant; in others the plant is so disfigured and weakened by the process as to become worthless.

BEAUCARNEA.—The species of this genus are superbly picturesque, and invaluable for the temperate winter garden. They make true stems which terminate below in a swollen bulb-like base. They require liberal culture, the soil to be rich fibrous loam and sand, with plenty of water all the summer. They are increased by seeds imported from Mexico,

where the plants flower freely. Home-grown seed is unknown, as hitherto the flowering of a Beaucarnea in Europe has been a rare event.

BONAPARTEA.—This is a fine genus of bromeliaceous plants requiring the same treatment as agaves. *B. juncea*, on account of its elegant rush-like leaves, is one of the most popular plants of the class in cultivation. It makes a fine ornament for a vase in the open air during summer. *B. gracilis* is equally valuable, though but little known.

CYCAS.—The Cycads combine the gracefulness of the tree fern with the noble aspect of the palm. A considerable proportion of the species succeed in the conservatory with no more warmth than is necessary to keep the ordinary stock of decorative plants in health. They merely require an abundance of light, with protection from frost and cold chilling winds. It is true some of the species will make a more rapid progress when in a temperature rather higher than that at which the conservatory is usually kept; but, on the other hand, it is equally true that reputed stove species are sufficiently hardy to admit of their being placed in the conservatory for the summer season. Further than this, the more hardy kinds are of the utmost value in the embellishment of the garden, *C. revoluta*, having been employed for several years in the subtropical department of Battersea Park. However, they are too rare to admit of more than a solitary specimen here and there being put out.

Although the annual growth made by the most healthy specimen is exceedingly slow, it must not be considered of little consequence whether they are dealt with in a thoroughly generous manner, or kept simply in a state of semi-starvation. It is, indeed, of the highest importance that they should be dealt with generously, and although the effects of good management will not be so strikingly apparent as in the case of a geranium or fuchsia, or a number of other soft-wooded plants, it will show its effects in time, and the cultivator will receive an ample reward in having specimens of a highly increased value. In this respect they differ from soft wooded plants, insomuch that they steadily increase in value and yield a fair interest on the first outlay. To grow them well it is only necessary to pot them in strong loam and sharp siliceous grit, and give them liberal supplies of water all the summer,

and decidedly scanty supplies during winter, but they must not be allowed to become quite dry at any time. They are increased from suckers and imported seeds.

DASYLIRION.—These are distinct and noble plants, well adapted to give a fine character to the conservatory in the winter, and a touch of tropical tone to the flower garden in the summer. The compost should be three parts good loam and one part each of peat and sharp sand. Give plenty of water all the summer, and very little all the winter.

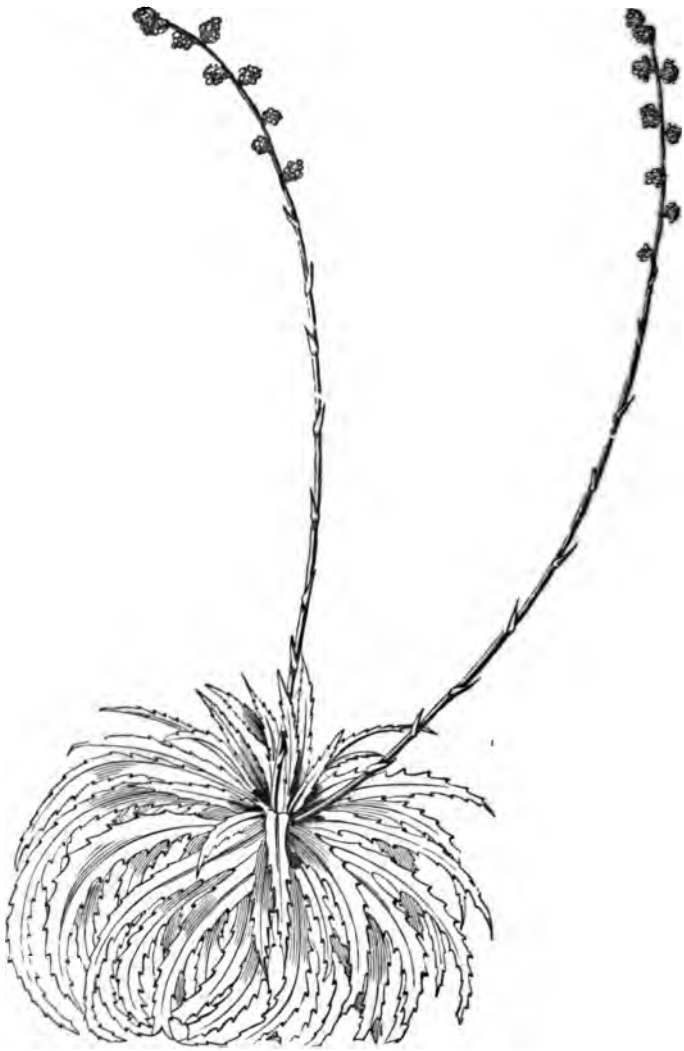
DRACÆNA.—This glorious family furnishes a number of remarkably noble conservatory plants that are nearly hardy ; and a still greater number of richly coloured plants that are rather tender. Among the conservatory kinds *D. australis*, *D. cannæfolia*, *D. indivisa*, and *D. robusta* are the hardiest; and, with the exception of those with coloured leaves which require warmth, the handsomest. To grow them well is such an easy matter that it only needs to be said that a compost consisting chiefly of good peat with a little loam will suit them, and that they must have plenty of water when growing. They are propagated in various ways but chiefly by cuttings or by circumposition. The last named process consists in attaching by the aid of a flower pot cut through from top to bottom, a body of soil to the stem of the plant. When roots have been thrown out the stem is cut through and a ready made plant is the result. Soon afterwards the remainder of the stem throws out shoots and forms a bushy plant, every stem of which may in time be circumposed if stock is wanted.

DYCKIA.—A spiny leaved race of curious plants that assort well both as to appearance and treatment with agaves. They must however not be kept so dry in winter as agaves. They are increased by suckers. There are not many species in cultivation, and of these *D. argentea* is the best. It is closely related to Hechtia.

ENCEPHALARTOS, MACROZAMIA, and ZAMIA.—Are to be treated as directed for Cycas, but as they are cooler and dryer plants, care must be taken to provide them with a somewhat stony soil and to guard against giving too much water.

FOURCROYA.—Treat the same as Dasylirion, taking care to put the plants out all the summer.

HECHTIA.—The plants of this genus closely resemble the



HECHTIA GHIESBREGHTI.

pine-apple, and indeed belong to the same natural order. A warm greenhouse will suit them better than a stove. *H. Ghiesbreghti* is a fine conservatory plant, with spiny recurved leaves of a rich green colour tipped with purple.

PALMS.—Are less cared for by amateurs than they deserve to be, for if prudently selected and favoured with a little commonplace attention they contribute in a material degree to the dignity and variety of the conservatory. The most useful of the family for greenhouse culture are *Chamœrops humilis, C. Fortunei, C. palmetto, Areca sapida, Latania Bourbonica, Jubœa spectabilis, Phœnix dactylifera*, and *Rhapis flabelliformis*. Palms are raised from seed and suckers, and stove heat is absolutely essential in either mode of propagating. To secure a nice collection it will be prudent to purchase plants of small size, and as they are remarkably cheap considering how choice they are, every conservatory that is kept safe against frost in winter may have the advantage of their elegant tropical leafage. Palms are generally starved in small gardens, and hence they make but little growth. But if annually shaken out and repotted in a mixture of tough fibrous peat and sharp grit, or fibrous yellow loam and silver sand, they will grow luxuriantly and acquire a splendid brightness of leafage. The best time to repot them is the month of May, and as a rule they may be put into the same pots after some portion of the old soil has been removed from the roots and the pots have been well scrubbed to receive them. Palms enjoy partial shade in summer and plenty of water. In winter the water supply must be moderate but they should never go dust dry. When planted out in turfy peat in a cool fern house the hardier kinds of palms make a charming addition to the elegant leafage that prevails.

PHORMIUM.—The "New Zealand Flax," *P. tenax*, is a well known plant which bears our winters without harm, in the milder parts of South Devon and Cornwall, but elsewhere is a cool conservatory plant. There is a *variegated* variety of it, and another with narrow leaves, called *P. Colensoi var.*, which, with the common green-leaved form, constitute a group of three noble habited and rather peculiar looking plants. They may be well grown in pots, but do much better planted out either in peat or loam provided it is gritty or stony in texture and well drained. They should have plenty of water all the summer, and very little in winter. The easiest way to multiply them is by dividing the stool by a sharp cut down-

wards, and potting the rooted pieces in small pots in compost consisting chiefly of silver sand.

XANTHORRHÆ.—This is the "grass tree" of the Australian bush. They are decidedly ornamental and very peculiar. Grow them in equal parts peat, loam, and bricks broken to the size of walnuts and the sharpest siliceous grit obtainable; give abundance of water in summer and very little indeed all the winter.

YUCCA.—The well known Adam's Needle represents one of the most interesting groups of plants in our gardens, and one which has peculiar claims on the attention of the amateur who can take interest in plants of noble forms while awaiting patiently for their full development. It is no small recommendation of the yuccas that there is very little to be said about their cultivation, for the fact is, it is difficult to kill them and it is a delightfully easy matter to grow them properly. They must have light always, and our sunshine is never too strong for them even in the height of summer, when they should be out of doors. In potting them take particular care to drain the pots well, and let the compost consist of about equal parts of the best turfy loam obtainable, bricks broken to the size of walnuts, and the drift from a gravel road, or lacking that, the finest siftings from the sweepings of gravel walks. Give plenty of water in summer but very little all the winter, taking care that they do not go quite dry. They are all nearly hardy and therefore need but little fire heat. For a beginner the best will be *Y. aloifolia*, of which there are two forms, the green and the *variegated; Y. concava, Y. filamentosa var*, and *Y. recurva*. The last is a hardy plant, but good enough for a place in any conservatory.

Yuccas vary considerably in their frequency of flowering. The cheap and very hardy *Y. flaccida* and *Y. gloriosa* bloom early in life and often; while *Y. aloifolia, Y. recurva*, and *Y. plicata* are in no haste to flower. Cultivators do not usually repine when they see the stately flower stems rising, because when the flowering of the plant is over, it loses its single stem and unity of character, and throws up a number of crowns. These new growths afford ready means of multiplying the species if removed, and if allowed to continue as parts of the old stock, will in time add to its dignity and massiveness. Therefore the flowering need not be all loss, and as for the flowers themselves, so beautiful are they that, in one respect *at least, it is* all gain.

CHAPTER XVI.

SUCCULENT-LEAVED PLANTS.

In this class are included the cactus, sempervivum, stapelia, mesembryanthemum, and their alliances, the prevailing characteristic being an excessively fleshy texture; in some cases stems and leaves are distinctly produced, in others, the distinction is beyond the ken of the ordinary observer, for the plant appears to consist of a columnar or spherical mass of vegetable pulp beset with formidable spines and bristles. A considerable number of succulent plants deserve to be reckoned amongst the most interesting and useful subjects to which an amateur gardener can give attention, for their variety of form is endless; many of them produce magnificent flowers; not a few are grotesque and comical in outline, and they will all bear occasional neglect with less harm than any other plants in our gardens. Alas! their very virtues are their bane as regards the favours they should enjoy in private gardens, for as they bear neglect with patience, they are oft-times neglected so much and treated so badly that they cease to attract by their curious seasonal growth and splendour of flowering, and so come to be regarded as worthless, and are, at last, left in dusty windows to perish, or, if they refuse to die, are possibly transported to the rubbish heap.

It is proper, however, to remark that many who profess to collect and cultivate succulent plants, treat them badly through a misconception of their place in nature. The tendency everywhere appears to be in favour of starving these plants, and the fact that they cling to life tenaciously in spite of the worst of treatment appears to justify the system. It is true they can subsist for a great length of time in a state of comparative desiccation at the roots, but it is also true that in their native lands they have the advantage of abundant supplies of water in the growing season, and, as a matter of course, though often located amongst rocks, they are free to

send their roots deep and far in search of food. But whatever may be the position of cactuses and their kindred at home, it is certain that all of them that are worth cultivating are worth cultivating well, and the three requisites to success are a rather rich, and substantial, and very gritty soil, abundance of water in the growing season, and the utmost possible amount of light the whole year round. Without exception they should be comparatively dry during winter, and the colder the house the more careful must the cultivator be to prevent injury by damp; but the tender kinds should be rather warm all winter and never quite dry, for when they appear to be quite dormant the flower buds and the next growth are quickly advancing in readiness for rapid development when the stimulus of solar light becomes sufficient. The capability of bearing any amount of sunlight renders these plants admirably adapted for the possessors of those little glass boxes which, in town houses, are called "conservatories," for, unfit as these structures usually are for plant growing, they answer admirably for sheltering succulent and hard leaved plants of small size on account of their dryness and strong light. The wonderful variety, both of form and colour, that may be ensured in a collection of succulents costing almost nothing in the first instance, and the very small space occupied by them if judiciously selected, are additional reasons in favour of their adoption by amateurs who value a bit of glass more highly than to waste it on ephemeral plants that can only be properly grown in comparatively large and well appointed plant houses.

ECHEVERIA.—This genus comprises some of our most useful decorative plants. *E. metallica*, *E. secunda*, and *E. secunda glauca* are well known as the most useful of the older kinds. *E. sanguinea* has acquired considerable repute as a bedder, but it makes a charming pot plant, and its deep red foliage presents a remarkable contrast to the others. *E. retusa* can fairly claim a place with the best spring-flowering plants we have; unlike either of those named above, it has a bushy yet compact habit, and flowers most profusely throughout the spring months. When it is desired to increase the stock of this species, the side-shoots, if taken off below where the wood has become moderately hard, immediately the plants go out of flower, will quickly strike and make flowering specimens of

considerable dimensions by the following spring. *E. rosea* belongs to the bushy growing section: the leaves average three inches in length and half an inch in width, and towards the end of the summer the margin becomes of a brilliant carmine, which increases in intensity up to the middle of the winter. The tuft of flowers with which each stem is covered in spring is unique, beautiful, and curious.

All the echeverias should be potted in a rather light gritty and rich compost, as they require something more substantial than broken brickbats, which many think is so essential in the cultivation of succulent plants. A very suitable compost may be obtained by well incorporating together four parts turfy loam, one part decayed cow-dung perfectly free from grub, and one part of silver sand.

Very few cultivators are able to increase their stock excepting from offsets, which at its best is a very slow affair. All strike readily from the leaves, and also from seed. A considerable degree of care is necessary in handling the seed, as it is very small, like that of the calceolaria; and if buried too deep and kept either too wet or too dry, a very small proportion, if any, will come up. The soil with which the seed-pots are filled should be very light and sandy, and made perfectly level on the top; then scatter the seed thinly over the surface, and cover it with a sprinkling of silversand. A warm greenhouse will be the most suitable position both for the seed-pots and the young plants until they become well established. Leaf propagation is effected by snipping off the small leaves from the flowering stems, and then inserting them in cutting pots prepared in the usual way. It is necessary to insert the base of each leaf in the sand, and to prevent the leaves becoming loose thrust a small piece of stick through them, to fix them firmly in the soil.

Cactus.—Under this head we shall speak of the globular species of the great Cactus family, comprising *Mammilaria*, *Melocactus*, *Echinocactus*, *Cactus*, and *Cereus*. To grow them in brick rubbish is a mistake; they require a mixture of equal parts turfy loam and leaf mould, or if the last named material is not available, fibry peat must be mixed with the loam and about a fourth part of the whole bulk of silver sand added. The best time to repot them is from March to May. The operation requires to be carefully performed for two rea-

sons, first, because the plants will suffer if roughly handled on account of their fleshy texture; and secondly, because their terrible spines and bristles inflict painful wounds on hands that approach them rudely. When a cactus is turned out of a pot remove the old soil from the roots and repot firmly, the base of the plant slightly elevated so that the earth will slope down from it all round, and steady it with a few sticks thrust in so as to prevent it toppling over. If you have any difficulty in getting the roots into the pot without crowding them, cut away all the smaller ones and any of the larger roots that appear to be dead or dying. If you can place them on a gentle hot bed at from 75° to 85°, they will make a good start after the potting, and will soon require water, but it is good practice to withhold water until they begin to grow. If well potted they may stand in the same pots three years. It is a great risk to employ manure in the preparing of a compost for the cactus, for although they will take to it and grow freely, they will be likely to rot in the ensuing winter.

Many of the kinds of cactus produce offsets freely, and to make plants of them is the easiest matter in the world. The cylindrical kinds may be cut from in May, and the cuttings should be put in sand in the full sun until they begin to form roots, and should then be potted and have the advantage of a gentle bottom heat. In case of requiring speedy increase of any of the globular kinds that refuse to produce offsets, cut the tip off and lay it on sand in the full sun until rooted. This will form a plant, of course, and then in time a number of offsets will be produced by the decapitated plant. They may be variously grafted on one another, but when the amateur arrives at that stage of practice he will have done with such a humble elementary book as this.

COTYLEDON.—A few good plants may be found in this genus as *C. velutina*, *C. coruscans*, and *C. decussata*, for example. They appear to live by their leaves more than their roots, and hence must be extra well drained and potted in a sandy compost. About a sixth part of old mortar of the size of peas may be added with advantage. These plants have acquired increased importance of late owing to the success that has attended their employment as bedding plants associated with sempervivums, echeverias, and sedums, in what is called "carpet bedding;" they are also worth attention as window plants.



COTYLEDON VELUTINA.

KALOSANTHES.—For conservatory decoration during July there is nothing to compare with the Kalosanthes, except it be the zonal pelargonium. It is not of course desirable to fill a house with them, to the exclusion of everything else; for they are very stiff and formal in their habit, and the colours are too much alike. But two or three dozen large well-grown plants would be grand for lighting up a house full of ferns and other ornamental foliage plants. To state the case in a few words, they ought to be grown by scores where they can only be numbered by units at present.

The Kalosanthes, or Crassula, as it was formerly called, is by no means difficult to grow well. In the first place, the propagation is effected by taking off the tops of the shoots that have not flowered as soon as the flowers are past; for the wood is then ripe and firm, and not likely to decay, which is the case if the tops are taken off early in the spring, when the plant is in full growth and the shoots soft and sappy. Any light sandy soil will do for filling the pots in which the cuttings are to be inserted, and a layer of dry silver sand should be put on the surface, as it runs down into the hole made for the reception of the cutting, and forms a base for the cutting to rest upon.

The cuttings strike with greater freedom this way than they would do if they were surrounded by soil only. After the cuttings are inserted, place the pots in a position where they are exposed to the full light and air, for no close coddling must be attempted, or the cuttings will very soon damp off, especially if the soil is kept too moist. A greenhouse shelf fully exposed to the sun, and a mat thrown over the glass, to break the full force of its rays and prevent them from being burnt up before they have formed roots, are probably the most favorable conditions to ensure their striking quickly. The branches can also be cut up into lengths and struck, if a number of plants are wanted, and the stock of growing points is limited.

After the cuttings are rooted, they must be put into small pots, and there remain during the winter. In the spring, shift into pots two sizes larger, and give them a little encouragement for a few weeks by placing them in a growing temperature, about ten degrees higher than that of the cold greenhouse. Directly the plants begin to make fresh roots into the new soil, nip the points off, and when the pots are full of roots, and the plants require a second shift, they can be either put singly into larger pots, or about three plants potted in one large one. The latter method is preferable, as a large specimen can be obtained quicker, and with less trouble, than by growing them on singly. The plants should now have all the light and air possible, for upon the maturity of the wood depends in a great measure the quantity of bloom the following summer. The drainage of the pots should be perfect, and water applied rather liberally when the plants are growing freely, but sparingly during the time they are at rest through the winter; just sufficient, in fact, to keep the foliage from shrivelling.

From the first the side-shoots must be neatly tied out, to keep them in their places, and prevent their snapping off, which they are very liable to when shifting the plant about. Immediately the beauty of the flowers is gone, cut the plants down in a somewhat similar manner to that in which pelargoniums are usually cut back after flowering. Give a little extra warmth to induce them to break quickly, and when the young shoots are about an inch in length take the plants out of the pots, remove a portion of the old soil, and repot in a clean pot the same size as that from which it was taken. No exact rule can be laid down as to how low each shoot should

be pruned, but they should be cut back to where the wood is firm, and a certain uniformity preserved. Fibrous loam, mixed with a good proportion of leaf-mould and sand and a liberal sprinkling of broken crocks, forms the most suitable compost.

KLENIA.—These are of small importance, yet two sorts at least ought to be grown, and these should be *K. repens* and *K. tomentosa*. The first has leaves of a light metallic blue colour.

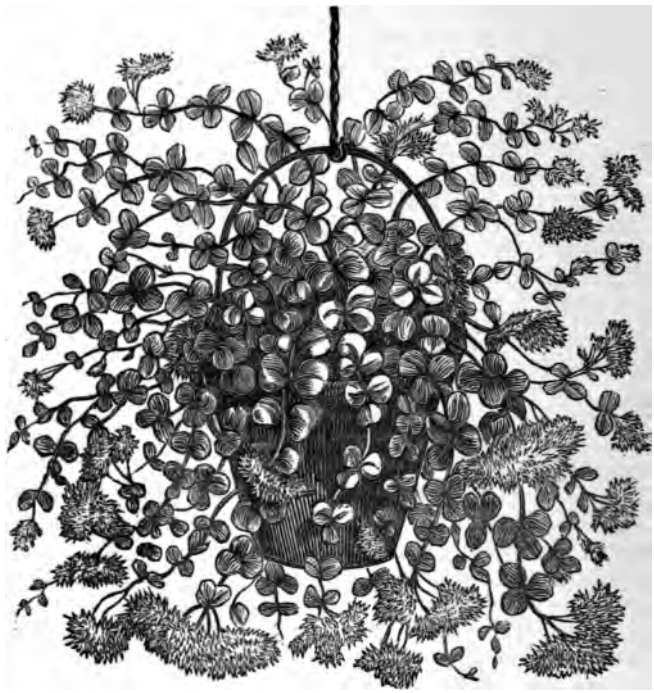
PACHYPHITON.—The beautiful silvery-leaved *P. bracteosum* has now become so well known that it is scarcely necessary to say that its distinct character and unique appearance render it well entitled to a place in the most limited collection. *P. lingua* is very similar in growth to the preceding, but the leaves are dark green instead of white. Large specimens of bracteosum are valuable for associating with Echeveria metallica in the flower garden, as well as in pots in the greenhouse or conservatory.

ROCHEA.—The beautiful *R. falcata* ought to be grown extensively for conservatory decoration during the autumn, instead of being grown merely as a curiosity. Even where soft-wooded plants generally are cultivated, a dozen or so of this Rochea should find a place as much for the showy appearance of the flowers as for the distinct and somewhat singular character of the plants. The Rocheas grow freely in the soil advised for the Echeverias, and are increased by means of the side-shoots formed at the base.

SEDUM.—A large number of the hardy dwarf-growing species are well worthy of a place under glass, the best and most distinct being *S. glaucum*, *S. multiceps*, *S. pulchellum*, *S. atro-purpureum*, *S. sempervivoides*, *S. kamtschaticum*, and *S. hispanicum*. The above should all be grown in rather deep pans, filled with a light and gritty compost. The soil should be raised about three inches higher in the centre than at the sides, which can be easily accomplished by fixing a few pieces of stone in the middle of the pans, and then dibbling in the young shoots over the entire surface.

Sedum Sieboldi and *S. spectabile* (*syn.* Fabarium) and their *variegated varieties* require a distinct system of management from the preceding, and are most valuable for conservatory decoration in the autumn. The first makes a capital basket

plant, and the second should be trained in exactly the same way as specimen pelargoniums are trained. Very little training will, however, be required, beyond simply tying out the young growth as soon as there is the slightest prospect of the plants becoming unshapely. The culture of both species is



SEDUM SIEBOLDI.

the same, excepting that the former should be grown under glass and in baskets, instead of in pots and in the open air during the summer.

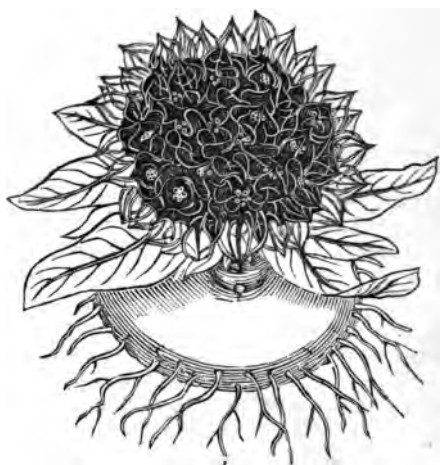
To propagate a fresh stock, take cuttings of the new growth in February, March, April, and May. Prepare them as cuttings by removing the leaves from the lowest joint, and dibbling them firmly into sand. If made early, a gentle

bottom-heat will be required, but after March the cuttings will strike without heat. The first season of growth from the cutting-pans keep the plants in three-inch pots, and allow them to grow as they please. They may be put out of doors till the end of September, and must then be housed. The next spring shift the stock of Sieboldi into pots one size larger, and that of Spectabile into two sizes larger, and in these sizes they will flower nicely. The flower-buds appear some time in advance of the flowers, but when at last these open, in the month of September, their lively rosy pink hue and symmetrical disposition are remarkably beautiful, and contrast chastely and cheerfully with the peculiar tint of the leafage. After the blooms have faded the stems die down, and are immediately succeeded by a new growth from the root, and thus, if encouraged by good culture, a specimen of either species will become larger and larger every year, and may be grown ultimately to colossal dimensions. Both require a rich light soil, and the best compost for specimens is as follows. Turfy loam two parts, rotten dung one part, bricks broken to the size of hazel nuts one part, sharp sand one part. In this mixture they should be potted firmly, and in spring, when the new growth is beginning to advance, the plants should be shaken out, a considerable portion of the soil removed from the roots, and be repotted in pots one or two sizes larger than the last. They require to be always exposed to the full daylight without shading at any season, to have abundance of water from April to August, and at other times to be kept merely moist enough to prevent flagging. When too large the roots may be divided.

SEMPERVIVUM.—These must have a prominent place in a small collection of succulents, because of their bold and distinct characteristics. The best of the large-growing species are *S. glutinosum*, *S. cuneatum*, *S. canescens*, *T. canariensis*, *S. S. arboreum*, *S. arboreum atro-purpureum*, a fine variety with deep bronzy leaves, *S. palma*, a noble kind with a table-like head supported on a thick stem about two inches in diameter, and *S. tabulæforme* with its table-like top supported on a stout stem varying in height according to age, instead of resting on the top of the pot. *S. bracteosum* is distinct from all the other kinds, and one of the freest growers in the whole family, as a huge specimen two or three feet in height and as much in dia-

meter can be grown in a very short time. It is one of the best window plants in existence, as it will grow freely in the most unfavorable quarters. The cuttings are most easy to strike, and after they are potted off singly will soon form fine specimens without any stopping or training. They are by no means particular as to what they are potted in, but the most suitable compost is one consisting of turfy loam, leaf-mould, and silver sand in equal parts. The amateur who has no partiality for succulent plants may safely adopt the purple leaved variety of *Sempervivum arboreum*, for it is one of the noblest greenhouse plants in cultivation, and with very little care will in a few years grow to the stature of a man and produce pyramids of yellow flowers in the early spring. To be safe from frost is enough for it all the winter, and to be out of doors in the full sun all the summer will contribute to its welfare.

STAPELIA. — This genus produces exquisitely beautiful flowers which are elaborately pencilled, but have no other attractions, and emit the unpleasant odour of tainted meat. A sandy soil must be provided for them, and a warm position all the winter.



BRACHYSTELMA BARBERIÆ.

CHAPTER XVII.

THE CONSERVATORY AND WINTER GARDEN.

HAVING now treated of the several sections of greenhouse plants that appear entitled to first consideration in these pages, we propose to offer a few remarks on the furnishing of the conservatory. It is too much the custom to devote the conservatory to ignoble purposes which necessitate labour and anxiety in proportion to their worthlessness. To grow soft-wooded plants in a lofty, airy, roomy edifice is always a mistake, for while they are unsuitable in character, the conditions are unfavorable to their prosperity, and they neither grow nor flower as they ought to justify the keeping of them. The noblest conservatory plants require far less skill and entail less expense to do them perfect justice than the ephemeral flowering plants that look so fresh and bright when thriving in a warm, damp, low-roofed house, when there is no fear of their being "lost" in a large perspective. The first step towards a proper recognition of the kind of embellishment required is to remember that a conservatory is not a stove, or a greenhouse, or a pit, or a hand-light, consequently it should not be used as any one of these things, or as all of these things combined. We employ the several structures enumerated, the conservatory alone excepted, for production simply; and, therefore, although a tasteful arrangement of plants is everywhere or everyhow to be desired, yet where *production* is the primary proposal, mere display is of secondary importance. On the other hand, we may, and do, and should employ the conservatory for production, but display is the matter of first importance, and therefore the conservatory claims the first labours of the "hand of taste." If it be necessary to tie out a plant to a forest of rude stakes, it may be done in the greenhouse; if it be necessary even to suspend a plant head downwards, and make the pot containing it the



IRON CONSERVATORY IN THE GARDEN OF H. BESSEMER, ESQ., BUILT BY HANDYSIDE AND CO., OF WALBROOK, LONDON.

principal attraction to the eye, it may be done in the greenhouse. But nothing of the kind should be allowed in the conservatory. The glass structures that are devoted to horticultural production are related to manufactures; the conservatory is related to the drawing-room, and, in the broad scheme of horticultural work, it is not a workshop or a museum, but a *garden under glass.*

To render this covered garden attractive and interesting at all seasons should be the principal object of its possessor. It may indeed be gay with geraniums and calceolarias in the months of June and July, and a damp, cold, cheerless den during the remaining ten months of the year. It should be *always* attractive, and should at all seasons offer for admiration something fresh and good, and at all seasons it should be as destitute as possible of any exhibitions of manufacturing processes. For ensuring permanent attractions, permanent features are required; mere display is above all things to be avoided, for the mind needs food of a better sort than colour simply, however strong in tone and perfect in combinations. Noble plants that have a history, that endure for many years, that acquire local renown, that present striking outlines, that exhibit distinctive stages of development, are much to be desired, and the more of such that we can find of a constitution very nearly adapted to the peculiarities of our climate, the better for the tasteful furnishing of the conservatory. Above all things, the conservatory should be attractive in the dull months of the year, and then its occupants should not be such as require a high temperature, for it is not well to take a vapour bath every time the mind desires refreshment in the midst of vegetable beauty.

It will be understood, of course, that we regard as proper conservatory plants Dracænas, Palms, Agaves, Yuccas, Camellias, Acacias, Beaucarneas, Dasylirions, Azaleas, Oranges, Tree ferns, Bonaparteas, Lomatias, Rhopalas, and others of like character, notable for distinctness and elegance of outline, rather than for high colouring, although amongst them we shall find some gay subjects. But we are no advocates for tameness and sameness in a conservatory. Given a sufficient breadth and variety of green furniture, and flowers may be employed with singular advantage. The stove, the greenhouse, and the pit will severally contribute of their productions to enrich the covered garden. The most tender plants, when in flower, will bear

without harm a temperature many degrees lower than that in which they have attained their full development, provided they are carefully prepared for it by removal in the first instance to an intermediate temperature, and during the whole time of their stay in the comparatively cool conservatory are supplied with less moisture than they had to promote growth in a higher temperature. Every season should supply new flowers to the conservatory. In the spring, potted bulbs will make a gay beginning, and if orchids are grown in the stoves the bulbs will be followed closely by some of the most resplendent of the family. As the season advances the greenhouse will supply pelargoniums, heaths, herbaceous calceolarias, and specimen petunias, and in autumn the pits will prove their usefulness by providing a glorious display of chrysanthemums. As a rule, however, the less we see of bedding plants in the conservatory the better, for we see enough of them in the open garden during the summer, and it is simply a tax on one's patience—that is, on the patience of one who believes in eclectic horticulture—to pass from a blaze of geraniums in the parterre to another blaze of geraniums in the conservatory. It is neither our business nor our pleasure to denounce people who, in their horticultural enterprises, are content with some half-dozen genera of plants; but we are bound to say, in defence of plants in general, that there are many fine things adapted to the conservatory which many who profess to love plants have hitherto not made acquaintance with. A rabbit cooked a hundred different ways is tiresome, and the cooking must be very tiresome to the rabbit.

Above all things that contribute to make a gay conservatory, the best of the greenhouse climbers should be thought of. As a rule, it is a folly to grow any of these plants in pots; they should be planted out in borders of sufficient breadth and depth to encourage a free growth, and consistently with the aerial space at command for training them; the number should be few rather than many, that each may display its character fully, and a succession of distinct and decisive features be produced rather than a mere confusion of vegetable tracery. It may suit the purposes of a botanical and experimental cultivator to plant in a conservatory as many kinds of climbers as there are rafters to afford them support, but a beautiful scene cannot be obtained by such practice.

There are many fine plants, showy, hardy, easy of culture,

that are but ill adapted for the conservatory, and therefore the selection is not a matter of taste solely. We object to bedding plants, because they belong properly to other scenes, but first-class specimens are admissible while in their prime. None of the fast-growing and free-flowering of soft-wooded plants that are most esteemed as bedders are adapted for permanent occupation of the conservatory; for, irrespective of their unfitness in habit and associations, they will not thrive in such a structure. The fuchsia is not strictly a bedding plant, for it loves not the dry soil and the burning sun as the geranium does, and thrives in the subdued light and constantly humid atmosphere of the conservatory. How fortunate! for the free-growing fuchsias make superb pillar plants under glass, and harmonise with whatever other subjects have an equality of claim to shelter with them. Turning in another direction, it may be said that plants of the heath tribe are as unfit for permanent residence in the conservatory as geraniums and calceolarias are. They need more light, more air, less warmth, less humidity, than the more proper inmates of the house, and, therefore, if employed at all, should be as moveable furniture, brought in when perfect, and removed when the flowers begin to fade.



LEICESTER VASE BY HUNT AND PICKERING.

CHAPTER XVIII.

ORCHIDS AND PITCHER PLANTS.

THE Orchids and Pitcher plants adapted for greenhouse culture are not sufficiently appreciated, owing, no doubt, to the prevalent belief that all such plants require steaming stoves, and are utterly beyond the reach of amateurs, whose short purses compel them to the observance of limited liability. It so happens, however, that a very choice selection may be made of plants equally to be desired for their curious structure, interesting history, and high floral beauty, and that such a selection may be grown to perfection in any greenhouse with the aid of a little more care than such things as bedding plants require. The best place for a few of these plants is in a compartment shut in by means of a glass screen at the warmest end of a house that is heated during winter sufficient for the safe keeping of a good collection of miscellaneous greenhouse plants. But if a house be constructed expressly for cool Orchids, we should advise that it be a smallish span-roofed structure, much below the ground line, and with the roof no higher than needful to allow of head room, even allowing that the path through the house is reached by descending three or four steps. The place should be damp and warm and snug. One great aid to success will be to have the brickwork of its natural colour, and clothed with such creepers as *Ficus repens*, and to have as little woodwork in the place as possible, and to have no whitewashed, glaring surfaces anywhere to reflect a dry heat on the under sides of the leaves of the plants. A width of twelve feet will allow of a flat table on each side, which may be made with boards and covered with a layer of sand; but we should prefer to have a bank of the natural soil supported by brick walls next the path. A layer of sandy peat might be spread on the surface and planted with the *common green* lycopodium, *Selaginella denticulata*, and on this

the pots could be stood on saucers turned bottom upwards. By arrangements of this kind a salutary humidity will be maintained in the atmosphere, and the orchids will be far more healthy and robust than if kept in a dry, woody, white-washed house, such as the Mexican succulents would delight in. Having made suitable provision for their comfort, the rest is easy, provided always that you do not attempt to grow stove orchids in greenhouse temperature, for in that you will certainly fail. Great things have been done of late years in the *cool* treatment of orchids, but there are certain kinds that require a high temperature and an abundance of atmospheric moisture, or they simply live without flowering, or, perhaps, instead of living, dwindle away. The selection at the end of this volume comprises all the best and safest for the amateur, every one of which may be grown to perfection in a suitable house by the adoption of the simple means we shall now describe.

There are two sections of orchids—the epiphytal, which grow on the branches of trees; and the terrestrial, which grow in soil. The epiphytal kinds can be grown fastened to blocks of wood, and be suspended from the roof, or in pots or baskets; but the terrestrial kinds must be grown in pots, and be potted in a compost consisting of turfy loam and peat in equal proportions, with the addition of a little leaf mould and silver sand. The epiphytes must have a compost much lighter than the above, and nothing can surpass a mixture of fibry peat, from which all the fine soil has been removed, and sphagnum moss, well mixed together. It is not necessary to be particular about proportions, because the whole of the epiphytes suitable for the greenhouse will grow in either peat or moss separately. Before using the latter, take the precaution to destroy all insect life that may be lurking in it, by putting it in boiling-hot water for a short time. Always effectually drain the pots; one half, or even two thirds, of the pot should be filled with broken potsherds. Place sufficient compost on the crocks to fill the pot to within an inch or so of the rim, and then spread out the roots on this, after carefully removing a large proportion of the old worn-out soil, and place a layer of the new material over them. If necessary a few pegs may be inserted to keep the soil in its place and the plants steady. To put them on blocks, simply fasten a little moss to the block with matting, and then spread out the roots over

the block, and after placing a thin layer of moss over them, secure the plant to the block with copper wire. *Cattleya citrina* should always be grown on a block, with its leaves hanging downwards, because in its native habitats it always grows on the underside of the branches of trees. Terrestrial species must have good drainage, but they do not require potting so high as advised for the others. The best time for potting, or dividing the plants, is just as they start into growth.

The temperature should range from 55° to 75° from March to October, and from November to the end of February an average temperature of 10° lower than that advised for summer will be the most suitable. The atmosphere must be kept rather dry through the winter months, as the plants will then be at rest, but during the season of growth it must be kept constantly moist by frequently sprinkling the walls and floors; and in very hot weather a slight sprinkle overhead in the afternoon, when shutting up, will be of great service. Syringing the plants must, however, be done very carefully, or much harm will result. There is no fixed rule with regard to the application of water to the roots, and it may be taken for granted that when the plants are growing freely, a fresh supply will be required as soon as the soil begins to feel rather dry. If they are watered constantly, whether they require it or not, the roots will soon rot and the plants perish. Those growing on blocks must be dipped in a pail of tepid water every other day during the summer, but in the winter once in three weeks will be quite sufficient. Pot specimens, when at rest, only require enough moisture to prevent the leaves and pseudo-bulbs from shrivelling.

Shade sufficiently to prevent the sun scorching the foliage, but at the same time admit all the light possible to promote a robust growth. This is especially necessary after the middle of August to promote the perfect ripening of the growth of the summer, for if this is not well matured before winter it is impossible for the plants to flower satisfactorily or remain in good health for any length of time. Orchids require very little air in proportion to many other classes of plants, but the house must be ventilated sufficiently to maintain a pure atmosphere. In the winter scarcely any ventilation will be required, and the air must only be admitted in calm and genial weather.

The most useful of all the cool orchids are the Cattleyas, Lycastes, Oncidiums, and Cypripediums. The last genus supplies the most famous, because most useful, of all known varieties of greenhouse orchids, and the beautiful *C. insigne*, or lady's slipper. This is a most accommodating plant, for it will grow grandly in the stove, and flower there all the



CYPRIPEDIUM INSIGNE.

winter through, but it will also thrive in a snug greenhouse, and may be nicely grown in a fern case in the parlour, and, indeed, in skilful hands, it becoms a first-rate plant.

To grow a fine specimen, half fill the pots with large potsherds, over these place a layer of moss, and fill up with a mixture of mellow turfy loam or tough peat, with a fourth part of

its bulk of small crocks and a few nodules of charcoal. In potting the plant, first loosen the roots carefully, and spread them out, and finish the potting in such a manner that the base of the plant will be elevated two or three inches above the rim of the pot. To do this it may be necessary to remove some of the soil from the pot first, but it is impossible to give directions for every particular. In any case the soil should be pressed about the roots moderately firm, and a coat of the finer part of the soil should be spead over the top for a finish.

If a very nice mellow loam is not obtainable, peat and sphagnum may be used instead, but a bit of first-rate turfy loam, of a hazel colour and "silky" to the touch, will grow a finer specimen than peat. While the plants are growing they must have regular supplies of water, but in winter they must be kept rather dry.

The pitcher plants, adapted to associate with the cool orchids, are those of America and Australia—Sarracenias, Darlingtonias, and Cephalotus. We must not think of Nepenthes, which requires the heat and moisture of the stove, or it becomes a plague to its sad possessor. But we have enough to afford a delightful change from the ordinary run of greenhouse subjects, and these plants are as curious as they are pretty. The coloured plate of *Sarracenia Drummondi*, published in the 'Floral World' for April, 1870, will convince any one who may be in doubt as to the ornamental uses of the family. As regards the production of pitchers, the plants now before us differ from the Indian pitcher plants in many particulars, and a short account of them will, we feel assured, be considered appropriate to the purpose of this work.

It will be observed, then, that the leaves of the Sarracenias are hollow cylinders, which terminate on one side in a trumpet kind of lip, like a vessel out of which fluid is to be poured, and on the other in a leafy appendage or lid. In the fully developed leaf we may notice that the principal beauty of the colouring is in this lid, which is sometimes of a dull purplish-red, sometimes snow-white, pencilled with carmine lines, and sometimes a delicate greenish-yellow. The leaf in its whole length is strengthened by an angular stem, which is very curiously produced; and when this is cut through it is seen to be exogenous, or an outside grower, a most surprising circumstance, botanically speaking, because, from what we are accustomed to in the forms of the vegetable kingdom, we should,

until the fact were demonstrated, say that for certain these were endogenous or inside growers. It will be observed that the young pitchers have the lid fitting down quite close; but



SARRACENIA VARIOLARIS.

as the pitchers increase in size the lid gradually rises, and then we may suppose it possible that water can find its way into the pitcher by means of condensed dew or the fall of rain. Not that water does find its way in; no! But water is almost always found there; *it is secreted by the plant.* If you dissect a pitcher, you will find that the epidermis, both within and without, is pierced with stomata, and the cellular tissue beneath is of a spongy texture, the cells large, and destitute of spiral vessels. Inside the pitcher are numerous hairs, which project downward; and it is found that when an insect enters, its downward course is easy, but escape is almost impossible; hence we not only find water, but also flies, wood-lice, and even beetles. Ah! the way to ruin is smooth and sometimes pleasant, and to go down is easier than to go up: so perhaps the flies find it in the pitchers, as we do also in the conduct of life. Water may be found in the pitchers long before the lid has been opened to catch it; and pitchers full grown are found with not a drop in them; indeed, you may find pitchers full that never were exposed to rain, and that were not filled by the syringing of the plants by the cultivator. To clear up the difficulty, we took some plants and kept one half of them plunged in pans of water, and the other half were kept as dry as possible so as not to kill them. What was the result? The plants that stood in water, had full pitchers; and the plants that were kept drier than they should be, had empty ones. It was reasonable to conclude therefrom that the plant has the power of storing up surplus water against the day of want, and that what we find is usually secreted, though that they should be filled by rain is, of course, possible. How could it be otherwise if rain happened to fall when the pitchers were open? As to the flies, they are, no doubt, attracted by the moisture, and perhaps a little sweetness. Put a jar of water in a house where there are crickets, and it will contain plenty of drowned crickets next morning. What, then, is the wonder that flies, finding the pitchers open, and smelling the moisture, should be tempted to their destruction? An English naturalist once supposed that the ichneumon fly would drag other flies, and hurl them over the edge of the pitcher to destruction, as a human murderer might throw a victim over a bridge. There is no mystery about the flies being there. Watch long enough, and you will see them go down, but however long you watch you will *never see them* return. The moral is too obvious.

The Sarracenias are natives of the North-American continent—some of them (*S. purpurea*, most certainly) range as far north as Canada; but for the most part they inhabit the warmer parts of the temperate zone, and are always found in bogs. Thus we have a key to their culture, for nature sorts her plants into their suitable zones and climates, and we have but to take notice of the way she places them. It is certain that nature does not stew these plants in such a steam as the hottest of the orchids thrive in; yet many of our amateurs think there can be no place hot enough for them, and the consequence is the plants have no beauty, and, instead of spreading fast and forming great tufts, they dwindle away and are pronounced difficult plants to cultivate. The soil generally used is peat, and, as a rule, this cannot be surpassed, though the beautiful *S. variolaris* may be grown in pure sphagnum, in the coolest and airiest part of the stove; and an admixture of soft stone with the peat or sphagnum is useful. The orchid grower will understand their requirements when advised that the soil which suits a Cattleya will suit a Sarracenia.

They require a certain degree of warmth with air, but must never be exposed to wind, more especially a drying wind, nor, as before remarked, to a great heat. They must have water, and they must have light. Shading is most injurious, and quite destroys the beauty of the pitchers. The best way to dispose of them is to place them on a shelf of an intermediate house or warm greenhouse, very near to the glass. *S. purpurea* does not need so much heat as even an intermediate house, and it may be grown as well in a frame as a greenhouse.

It is essential to keep these plants cool in winter, that they may rest naturally, as they do in their native bogs, where they are sometimes subjected to much cold—to freezing, in fact; though such as *S. variolaris* will not bear frost when under cultivation, and at all times needs more warmth than the others. A moist air is good for them at all times. All about them should be frequently made wet, to cause a plentiful dew; nd as to what they stand on, let it be a solid bench, not a bed of soil or a trellis, for in either of such positions they may be subjected to excess of evaporation from the too rapid movement of the air around them. Keep in remembrance that they are bog plants; they stand in water, they

are bathed in vapour, yet they have fresh air and sunshine. These conditions they need when under cultivation. In

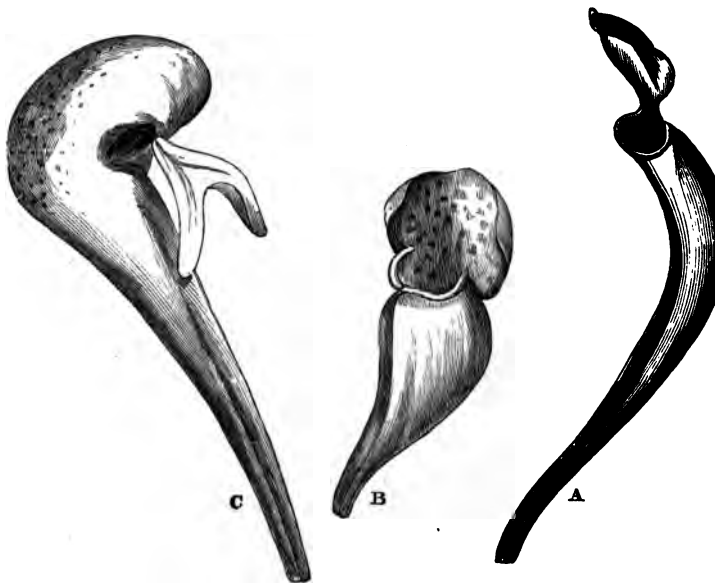


SARRACENIA DRUMMONDI. (Flower just expanded.)

respect of propagation, that is easily accomplished by division *of the root.*

Of the species there are not many. The most useful is *S. Drummondi*, of which there are several varieties, *alba* being perhaps the best. This is of tall growth. The pitchers are nearly a yard high. The lid is most delicately veined with carmine, on a creamy pale green or snow-white ground. The flowers are dull purplish red, handsome and peculiar. The variety of Drummondi called *rubra* has pitchers richly veined, red and pale green; the flowers mount high above them, and are of a great size, and a most beautiful purplish red colour.

S. flava is also a tall kind, the pitchers being two and a half feet high, and the flowers a trifle taller. The latter are yel-



A, Leaf of *Sarracenia flava*; B, Leaf of *Sarracenia purpurea*; C, Leaf of *Darlingtonia Californica*.

lowish-green, quite transparent; the pitchers also are the same colour. It is a fine species. There is a variety of this called *picta*, which is more distinctly veined than the species.

S. purpurea is very dwarf, with large pouch-like pitchers distended in the middle. The colour of the pitchers is red-

dish, shading to dull green. The flowers are a fine red colour. This is the easiest to obtain, and the hardiest of them all. In a sheltered position in a bog it would live through the year in any part of England.

S. variolaris has the lid of the pitcher bent over the mouth of the tube in a manner different to all the rest. It is a beautiful variety, of large growth, and has yellow flowers. The lid of the pitcher is purplish red, spotted with white.

S. psittacina is a miniature, with small pitchers which spread horizontally, with a kind of inverted hood for a lid. The appearance of a perfect pitcher of this is that of a parrot's head reversed, as when a parrot suspends itself head downwards from its perch. The pitchers are dull red, spotted with white, and the flowers are deep sanguineous red.

Darlingtonia Californica is an interesting alliance of the Sarracenias. It has a curious pitcher, the lid of which forms a perfect hood, from the inner edge of which the true leaf is produced. The hood is usually so placed as to completely exclude rain, yet moisture and dead flies are commonly found in the pitchers.



CEPHALOTUS FOLLICULARIS.

The Australian pitcher plant *Cephalotus follicularis* is a native of the swampy lands of the south-west of Australia, *more especially* in the neighbourhood of King George's Sound

It is extremely pretty and it presents a problem to the vegetable physiologist, for its pitchers are developed apart from the leaves (if they *are* leaves), and the plant always presents examples of two distinct forms of foliation. It has no stem, but grows in a close tuft amidst the wet moss which forms its bed, and when it flowers presents a near resemblance in its floral organs to a ranunculus.

The Cephalotus has been grown to perfection in a warm greenhouse, and may be associated with either Sarracenias or Nepenthes; but its proper place, as regards temperature, is midway between them. The soil best adapted for the plant is a mixture of chopped sphagnum and the fibre of peat, without any of the earthy matter, with an admixture of potsherds broken to the size of peas. It should not stand in pans of water; but plenty of water it must have, in common with its associates; and if the atmosphere of the house in which the plant is grown does not happen to be saturated with moisture it must be covered with a bell glass, which should be cleaned daily. The best place for it in a plant collection will be where the temperature averages 45° to 55° through the winter, and 60° to 80° through the summer.



CYPRIPEDIUM INSIGNE.

CHAPTER XIX.

GREENHOUSE ROSES.

THE rose is not a greenhouse plant, but we shall never tire of seeing roses in the greenhouse and conservatory, provided they are well grown and flower early. If these two conditions are not fulfilled, roses under glass are simply out of place, and the amateur would save worry and vexation by quietly consigning his greenhouse roses to the fire when a general burning of rubbish takes place. A lover of roses will derive one peculiar pleasure from growing them under glass, and that is, he will see them in a remarkably fresh and brilliant condition in the months of April and May, when there are no roses out of doors, and his sheltered pets will be as attractive for the delicate colour and texture of their leaves as for the splendour of their early and most welcome flowers. To do roses well under glass requires a little care, but there is nothing occult in the business, and the amateur who means it, and knows a little of the rose to begin with, will be sure to succeed. A rose house is a fine garden feature, but it is not necessary to devote a structure especially to roses, for they may be grown with either hard-wooded or soft-wooded plants if carefully managed, and, of course, the warmer the house the earlier will they flower. They must have plenty of light and air, and in any case they must be forced gently; so it will be unwise always to put them in heat suddenly, for, instead of flowering nicely, they will become covered with mildew and the flower-buds will drop before they open. In an unheated house pot-roses may be nicely done, provided the aspect is sunny, and the shelter will aid them so much that they will flower a month or more in advance of those in the open ground. The best time to begin is in September or October, when vigorous plants in five- or six-inch pots may be purchased at a cheap rate. These, pruned back to within three or four buds of the base of the shoots, will form nice speci-

mens. They may be purchased either on their own roots, on the brier, or the manetti, according as they are most readily procured; but if there is any choice in the matter, give preference to those on their own roots. Neat standards of one to two feet high, however, are pretty if they have good heads. It is of considerable importance to avoid disturbing the roots of such as are intended for early flowering, and when they come to hand simply stand them in a sheltered position, and cover the pots with leaves or other loose material, to prevent the frost penetrating the soil.

They should be pruned some time in December, and be removed to the greenhouse or pit. If a pit can be devoted to them it should be kept rather close, to encourage them to start into growth early, and on the afternoons of fine bright days a sprinkle overhead with tepid water will be of considerable service. The syringing overhead will be none the less useful if they are placed in the greenhouse, but, of course, it will be necessary to avoid wetting the foliage of such plants as should be kept dry, and also creating a dampness in the atmosphere hurtful to the hard-wooded plants which may happen to be in the house. The soil, even when the plants are quite dormant, should not be allowed to become dust-dry, and when in full growth liberal supplies of water will be necessary. After they are fairly started, moderately weak liquid manure should be employed in preference to clear water. The drainage from the manure-heap diluted with water will form an excellent stimulant; and second in value to that is guano-water, prepared by mixing the guano with clear soft water, at the rate of two ounces to three gallons. Horse-droppings steeped in water also make an excellent liquid manure. It must be used perfectly clear, and the colour should be that of pale ale; if a deeper colour it will be too strong, and will do mischief.

As the growth progresses it will be necessary to tie the shoots neatly, and in such a manner as to ensure well-formed specimens. The only enemies they will have to contend with when making their new growth are green-fly, mildew, and the rose-grub. The destruction of the latter can be accomplished by hand-picking, and a moderate dose of tobacco-water will soon make short work of the green-fly; dusting the foliage with flowers of sulphur is the best remedy for mildew.

When they go out of bloom remove to a sheltered position

out of doors, and attend to them with the same care as regards watering as when they were indoors. In a fortnight or three weeks after their removal from the greenhouse, shift into pots one size larger, and use a compost consisting of three parts turfy loam and one part hotbed manure. A few crushed bones mixed with the compost will be of great service in promoting a vigorous growth; and wherever roses are grown in pots, the bones, as they come from the kitchen, should be carefully preserved, and when the roses have their annual shift be broken up and mixed with the compost. A few larger pieces mixed with the crocks will be of service. After they are repotted, stand them upon stones or coal-ashes, and fill in between the pots with dry leaves or other loose material, for the purpose of preventing a too rapid evaporation of moisture from the soil during the hot weather. They must be placed far enough apart to afford ample space for the development of the new growth. During the summer an abundance of moisture will be required, and in the evening, after a hot day they will be benefited by being watered overhead with a watering-can to which a coarse rose has been affixed.



CALCEOLARIA HYSSOPIFOLIA.

CHAPTER XX.

SUMMER CUCUMBERS AND SEEDLING PELARGONIUMS.

THE cucumber properly belongs to the kitchen-garden and frame-ground, but a few words on our mode of producing summer cucumbers will probably be valued by many readers of this volume, for we have, during many years past, very profitably occupied with them a house that during winter is filled with seedling pelargoniums. It happens, too, for our encouragement, that about nine-tenths of all that has been written about cucumbers in horticultural papers has related to the winter management, an implication, perhaps, that to grow cucumbers in summer needs so little skill that there need be very little said about it. To be sure, it is easy enough to grow them, even in common frames, with or without fermenting material, yet the cutting of a cucumber fit for the table is an extraordinary event in some few gardens where only one man is kept. But never mind about relative difficulty, and all that sort of thing: cucumbers are much more in demand during summer than winter, and our way of growing them is the most simple ever heard of, and the results are all that could be desired, and much more than, in ten thousand like cases, would be expected.

To begin, then: we do not employ artificial heat at any stage of the business, not a particle of fermenting material, and the plants are positively ornamental, and when full of fruit present a most beautiful appearance, which cucumbers in frames never do. The summer cucumber house is a narrow span-roofed "Paxtonian," put up about twenty years ago by Hereman and Morton. There is simply nothing at all peculiar in it, save and except the well-known Paxtonian principle. On each side of the central path is a border of earth supported by skirting-boards. On the lights are fixed stout iron brackets for the support of open shelves, and from October to

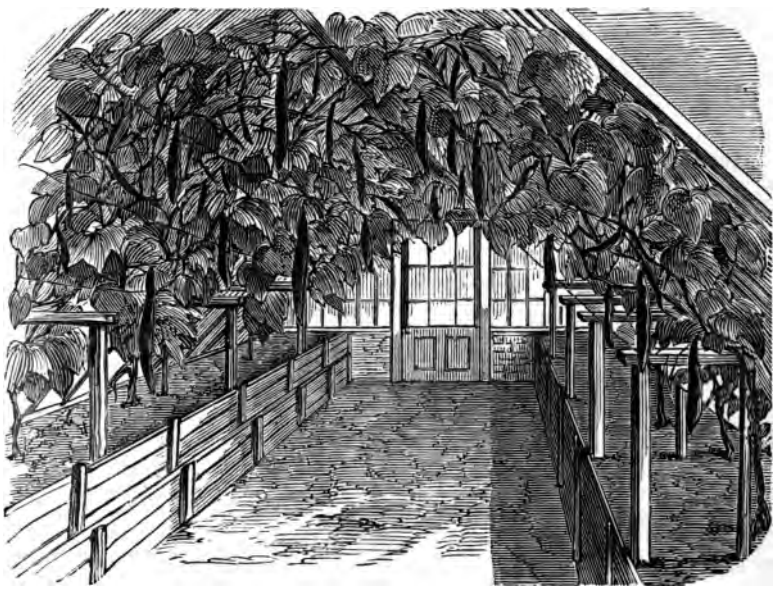
the end of May the house is filled with seedling geraniums in tiers one above the other from ground-line to roof. Of course these need artificial heat, and that is provided in the usual way by means of hot-water pipes. But there is an end of firing here long before the cucumbers are planted, and these, as above remarked, are grown without the aid of heat from first to last—that is, as the word "heat" is commonly understood.

The seeds are sown in small pots, in light stuff, about the end of March, but the early part of April is none too late. The seed pots are placed on a top shelf in this same house, or in any other house where they can have the full benefit of sunshine. In due time the plants appear, and they are *not stopped*. By careful nursing they soon take their places in 48-size pots, and by the time they have filled these pots with roots the house is being cleared for the summer. The shelves are all removed, and a bed of fresh soil is made up in the border on each side. This consists chiefly of turfy loam, with a small allowance of rotten manure and gritty leaf-mould. A rich soil is not to be desired, but the bed should have at least a foot depth of fresh material on it every year; for the stuff that has received the drip of watering all the winter will not do for cucumbers.

The plants are not put out until the border has been well warmed by the sun, this process being hastened by shutting the house close for a few days. In the centre of every light is placed a plant with a stick to support it; and thereafter at every opportunity a careful man constructs a trellis, first by means of a few lengths of stout copper wire running lengthways, and then vertical lengths of cheap tarred twine are added as required by the advancing vines. It may appear by the story a tedious business, but in truth it is all so simple that it is almost a wonder that enough can be said about it to make even one short chapter. The house is kept close for at least a week after planting, unless, indeed, the sunshine is very strong, and then air is given. But the management of the plants is directed to securing a vigorous growth, and if there is an early show of fruit we remove it; in fact, not one cucumber is allowed to swell until the vines have nearly reached the top of the house. As the house stands east and west, the south side has to be slightly shaded. This is accomplished by splashing the glass with thin whitewash, so as to

mottle it. Air is given plentifully after the first week. The syringe is used freely every evening, when the house is closed. Water is given at the roots as required; sometimes they go a fortnight without a single drop more than falls upon the leaves and the soil from the syringe; or during hot dry weather they may need to be well watered at the roots two or three times a week.

Here the story should end. But it may be well to add that abundance of room is allowed amongst the vines; that the crop



PAXTONIAN CUCUMBER-HOUSE, STOKE NEWINGTON.

is severely thinned throughout the season; that in spite of severe thinning the produce is enormous and constant, so that the spectacle presented by the house when the vines are in full bearing calls forth exclamations of surprise, not only from the uninitiated, but from experienced practicals. Yet one word more. Seasons differ immensely, and we have always adapted

our movements to the state of the weather and the indications of the barometer. Yet during the past seven years the dates of planting cucumbers in this house, the dates of cutting the first fruit, and the dates of taking down the worn-out vines, have varied so slightly that we might from those dates conclude that this climate is one of the most constant on the face of the earth. We know it to be otherwise, but no matter. Our average date of sowing the seed has been March 20; of planting out, June 6; of cutting the first fruit, July 3; thence to the middle of October the appearance of the house is represented in the accompanying sketch. The *Sion House* breed suits best for this off-hand system, and the best of that breed is *Rollisson's Telegraph*, but *Cuthill's Black Spine* also answers admirably.

The seedling pelargoniums that occupy this house all the winter are grown in accordance with the directions given in the chapter on the subject.

CHAPTER XXI.

HARDY PLANTS IN THE GREENHOUSE.

INCIDENTALLY several kinds of hardy plants have been referred to as suitable for greenhouse cultivation. It remains, however, to be said that there are certain kinds of hardy herbaceous and alpine plants that really require the shelter of glass, but never need the aid of artificial heat, and are particularly worthy of the attention of the amateur who can find delight in seeking out the minor gems and jewels of the vegetable kingdom. There are to be found hundreds of plants of the most beautiful character and the most hardy constitution, which it is difficult to keep alive in the open border, not because our winters are too cold, but because they are too damp and variable. Many of these are known as "frame plants," and others are grown on rockeries, and others again are popular bedders, and a considerable number are varieties that puzzle their possessors until they are taken into an unheated airy greenhouse, and there they thrive in a surprising manner. We propose that a selection of such plants should be made expressly for cultivation under glass, and to present the idea in the simplest manner possible we will build for them a low span-roofed house, with sliding lights and glass sides, resting on low brick walls: in these walls ventilating shutters; the inside furniture to consist of a simple stage on each side, and *that is all.* The question of heating is intentionally avoided, for this house is not to be heated, for (amongst many) three good reasons. In the first place, heating, no matter by what means, occasions much expense and trouble, and unless there are regular gardeners employed, it usually proves a vexation beyond its value, and the neglect of one night may result in the loss of a whole houseful of plants, when perhaps the winter is nearly over. In the second place, for the plants to be grown in this house, fire-heat is not

wanted, and yet to grow them well and enjoy them thoroughly the shelter of glass is a *sine qua non*. From October to April, when out-door pleasures are few, and flowers of all kinds scarce, the alpine house is to be gay as a well-furnished jewel-casket—in fact, it will be a jewel-casket if only our advice is carried out to the letter. In the third place, one of the great advantages of this house is that geraniums, verbenas, petunias, and other soft greenhouse plants of the same class, will not live in it, and so the gems it is to shelter will not be thrust out of their legitimate home by usurpers of their rights. In connection with this third advantage, it must be remarked that the collection should be at its best in winter, and therefore to make it a store place for bedding plants would be a violation of the scheme, for bedding plants offer no attractions in the dark season.

A cheap delight is to be looked for as the result of the development of the plan. But pray bear in mind, we are no advocates of sheds and shanties of obnoxious aspect for plant-houses. Experience has always taught that those who build at all should build well. First, then, choose a spot for the house where it will be easily accessible for yourself and friends in the winter season. It may, indeed, be connected with the dwelling, and made to open from one of the rooms, or it may be reached by a covered way. The only essential matters, however, are to select a convenient site, to make a good foundation and a drain, if necessary, to secure dryness in winter; to make the house run due north and south if possible, so that the sun will every day at noon stand opposite the south door; and, lastly, to preserve an open space outside at one or both ends of the house, so that if ever you feel inclined to lengthen it, you may do so without having to cut down trees or remove buildings. It must be remembered that this cool plant-house may be readily converted into a greenhouse proper, by means of a furnace and boiler and a service of hot-water pipes. It is one of the great advantages of building a house properly in the first instance, that you can apply it to many purposes afterwards, as inclination or circumstances may require. You may, at small expense, convert this sanctum into a greenhouse, a stove, a vinery, or a pine pit; therefore you are not doomed to be always a jeweller because you have speculated on the construction of a casket.

Now as to the plants. They must consist exclusively of

such as are thoroughly worthy of pot culture, and quite or nearly hardy; such as may be improved by the protection glass will afford, yet will not require heat for their preservation through the winter. The prudent cultivator will, however, be provided with mats, or some other equally handy protecting material, to put over the glass during severe frosts, and at such times will take care to put his most valuable plants on their sides, on the ground, under the stage, with a little dry hay sprinkled over them. We may now choose for the collection palms, bamboos, yuccas, agaves, and a host of herbaceous and alpine plants that flower during the winter and spring months. As a low roof is preferable for plants that grow in herbaceous tufts, it is not desirable to speculate heavily in such things as palms and agaves; yet there must be a variety, and a few plants of noble character will help to bring out, by contrast, the peculiar beauty of the flowering alpines. It is best to begin humbly, and become accustomed to the house and the plants before venturing on any great expenditure, and therefore the list which follows comprises only sixty of the cheapest and most beautiful plants for the purpose. Obtain those sixty first, and give them twelve months' care, and then launch out boldly if you will. Our aim is always to prevent such as ride hobbies in our fields from riding into pitfalls, or by any uphill course that shall destroy their zeal by weariness. We shall arrange the plants alphabetically under their botanical names only, as they are known to the nursery trade.

Achillea millefolium rosea, fol. var.; Acorus gramineus, fol. var.; Arum Italicum; Aspidistra lurida, fol. var.; Aubrietia purpurea, fol. var.; Bambusa Fortunei, fol. var.; Carex pendula, fol. var.; Centaurea argentea; Chamœrops humilis; Cineraria platanifolia; Convallaria majalis, fol. striatis; Cyclamen coum album; Cyclamen marmoratum; Cypripedium calceolus; Cypripedium spectabile; Dactylis glomerata elegantissima; Dianthus hybridus Marie Pare; Dianthus hybridus striatiflorus; Dielytra spectabilis; Dielytra spectabilis alba; Dodecatheon meadia; Echeveria glauca; Echeveria metallica; Erythronium dens canis roseum; Eucomis punctata; Funkia Japonica lutea, fol. var.; Funkia ovata, fol. var.; Funkia undulata, fol. var.; Goodyera pubescens; Astilbe (Spiræa) Japonica, fol. var.; Iris reticulata; Ligularia Kempfæri; Lilium candidum luteis

variegatis; Orchis mascula; Ornithogalum thyrsoideum; Phœnix dactyliferum; Phormium tenax, fol. var.; Polemonium cæruleum, fol. var.; Polygonatum multiflorum. fol. var.; Polygonum filiforme, fol. var.; Primula concolor; Primula cortusoides amœna; Primula Japonica; Primula denticulata; Primula farinosa; Rhodea Japonica, fol. var.; Richardia æthiopica; Saxifraga incrustata; Saxifraga pyramidalis; Saxifraga sarmentosa; Sedum Japonicum, fol. var.; Sedum Sieboldi, fol. var.; Sedum spectabile; Symphitum officinale, fol. var.; Vallota purpurea; Veratrum album; Veratrum nigrum; Viola odorata, "The Czar;" Vitis hederacea; Yucca filamentosa, fol. var.; Yucca recurva.



DOUBLE WIRE BASKET FOR THE CONSERVATORY.

CHAPTER XXII.

SELECTIONS OF GREENHOUSE PLANTS.

In the several chapters on plants and their cultivation, typical species and good varieties have been named, but the lists that follow will probably prove useful, as they comprise the most distinct and beautiful plants in the several classes, and are for the most part limited to such as the amateur should obtain in the first instance.

Azaleas.—A. Borsig, Admiration, Andersoni, Antoinette Thelemann, Beauty of Reigate, Bouquet de Roses, Charmer, Comte de Hainault, Coquette de Gand, Distinction, Dominique Vervaene, Duc de Nassau, Duchesse Adelaide de Nassau, Etoile de Gand, Fascination, Flag of Truce, Flower of the Day, Forget-me-not, François Devos, Grande Duchesse de Bade, Guillaume III., Her Majesty, Imperialis, Juliana, La Victoire, Leopold I., Le Superbe, Lizzie, Madame Alex. Hardy, Madame Alex. van Langenhove, Madame Camille van Langenhove, Madame de Cannaert d'Hamale, Madame Dominique Vervaene, Madame Iris Lefebvre, Madame Léon Maenhaut, Madame Louis van Houtte, Madame van der Cruyssen, Madlle. Léonie van Houtte, Madlle. Marie van Houtte, Président A. Verschaffelt, Président Humann, Prince Albert, Prince of Orange, Queen of Roses, Reine Blanche, Rubens, Souvenir de Prince Albert, Stanleyana, Stella, Vivid.

Basket Plants.—Cereus flagelliformis, Convolvulus mauratinicus and any of the annual species; Cobea scandens variegata, Disandra prostrata, Dolichos lignosus, Fagelia bituminosa, Ficus repens, Fuchsias, Gompholobium polymorphum splendens, Hardenbergia monophylla, Hibbertia dentata, Ipomeas, Lobelia erinus in variety, Lophospermum Hendersoni, L. scandens, L. spectabilis punctata; Maurandy Barclayana in variety, Mikania scandens, Mutisia decurrens, Pelargo-

niums, Zonal and Ivy-leaved; Plumbago capensis, Rhodochiton volubile, Rhynchospermum jasminoides, R. jasminoides variegatum; Saxifraga sarmentosa, Sollya heterophylla, Tropæolum tricolorum, and others in the same way, and T. Lobbianum and others of the same type; Zichya inophylla floribunda.

BOUVARDIAS.—Angustifolia, Bridesmaid, Elegans, Leiantha, Splendens, Vreelandi.

BULBOUS AND TUBEROUS-ROOTED GREENHOUSE PLANTS.—Agapanthus umbellatus, A. umbellatus albus; Alstrœmeria acutifolia, A. argentea vittata, A. multiflora, A. tricolor; Anisanthus splendens, Asparagus decumbens, A. dulcis; Brunsvigia Josephinæ, B. pumila; Calochortus lilacinus, C. elegans; Calostemma purpurea, Chlidanthus fragrans, Coburgia miniata, Crinum capense alba, C. capense rosea; Cyanella cærulea; Cyphella Herberti, Cyrtanthus coccineus, C. Mackenni, C. obliqus; Eucomis punctata, E. regia; Gastronema sanguinea, G. sanguinea flammea; Griffinia Blumenavia, G. hyacinthina, G. hyacinthina maxima; Habranthus Andersoni, H. pratensis, Hæmanthus albiflos, H. puniceus, H. tigrinus; Hemerocallis Kwanso variegatus, Ismene amancæ, I. calathina; Lachenalia luteola, L. pendula, L. quadricolor, L. tricolor, L. versicolor; Littonia modesta, Ornithogalum thyrsoides, Pancratium fragrans, P. illyricum, P. notatum, P. speciosum; Pentlandia miniata, Phycella chloracea, Rigidella flammea, Saundersonia aurantiaca, Tritelia uniflora, Tropæolum azureum, T. tricolorum grandiflorum; Urceolina pendula, Vallota purpurea, V. purpurea major.

CALCEOLARIAS, *shrubby*.—Aurea floribunda, Aurora, Beauty of Montreal, Clio, Crimson Queen, Grandis, Pluto, Prince of Orange, Sparkler.

CAMELLIAS.—Alba plena, A. J. Downing, Arch-Duc Etienne, Arch-Duchesse Augusta, Bella Romano, Commendatore Betti, Chandleri elegans, Countess Corradino, Countess of Derby, Countess of Orkney, Duchesse de Nassau, Duchesse d'Orléans, Donckelaari, Elvira Bianchini, Emilia Gavazzi, Fra Arnaldo da Brescia, General Cialdini, Giardino Schmitz, Grandis, Henri Favre, Imbricata, Il Tramonto, Jenny Lind, Jubilee, Lavinia Maggi, Leopold I., Madame Ambroise *Verschaffelt*, Marchioness of Exeter, Mathotiana, Matteo

Malfino, Monsieur d'Offey, Mrs. Dombrain, Napoleon III., Nonpariel, Ochroleuca, Princess Mary, Princess Baciocchi, Queen of Beauties, Reine Marie-Henriette, Rubens, Saccoi Nova, Storeyi, Targioni, Tricolor imbricata plena, Valtevaredo, Vicomte de Nieuport, Wilderi, Zoraide Vanzi.

CANNAS.—Annei discolor, Bihorelli floribunda, Chatei grandis, Compacta, Daniel Hooinbrench, Député Heron, Gloire de Lyon, Musæfolia sanguinea, Zebrina superba.

CARNATIONS, TREE. — Adela, Attila, Avalanche, Blanche, Boule de Feu, Brilliant, Congress, Covent Garden Scarlet, Duke of Wellington, Garibaldi, Georges de Fredeville, Herbert, Hermione, Jean Bart, La Belle, Lady Stuart, Maiden's Blush, Novelty, Oscar, Rembrandt, Souvenir de la Malmaison, The Dragon, Vestal, White Nun.

CHRYSANTHEMUMS.—*Varieties with large incurved flowers of the finest form.*—Abbé Passaglia, Beethoven, Beverley, Blonde Beauty, Bronze Jardin des Plantes, Cherub, Dr. Brock, Duchess of Buckingham, Duchess of Wellington, Empress of India, Fingal, Florence Nightingale, General Bainbrigge, General Hardinge, General Slade, Golden Ball, Gloria Mundi, Golden Beverley, Golden Eagle, Golden Dr. Brock, Golden John Salter, Guernsey Nugget, Her Majesty, Iona, Isabella Bott, Jardin des Plants, John Salter, Lady Hardinge, Lady Carey, Lady Slade, Le Grand, Lord Derby, Miss Mary Morgan, Mrs. G. Rundle, Mrs. Brunlees, Mrs. Haliburton, Mrs. Sharp, Mr. Evans, Mr. Gladstone, Mr. W. H. Morgan, Pink Pearl, Prince Alfred, Prince of Wales, Princess Beatrice, Princess of Wales, Princess of Teck, Rev. J. Dix, Queen of England, Renown, Rotundiflorum, Yellow Perfection.

Large incurved and reflexed varieties best adapted for specimen culture.—Alma, Annie Salter, Aurea Multiflora, Cardinal Wiseman, Carissima, Christine, Chevalier Domage, Countess of Granville, Dr. Sharp, General Bainbrigge, Gloria Mundi, Golden Christine, Golden Cluster, Her Majesty, Rival, Little Harry, Lord Clyde, Lord Ranelagh, Julia Lagravère, Le Grand, Mrs. George Rundle, Mrs. Forsyth, Prince Albert, Prince of Wales, Progne. Queen of the Isles, Sam Slick, Sparkler, Vesta, Virgin Queen, White Christine.

Large Anemone-flowered varieties. — Emperor, Empress, Fleur de Marie, George Sand, Gluck, King of Anemones,

Lady Margaret, Louis Bonamy, Margaret of Norway, Mrs. Pethers, Prince of Anemones, Princess Marguerite, Queen Margaret, St. Margaret, Sunflower.

Pompone varieties adapted for specimen culture and decorative purposes generally.—Adonis, Aigle d'Or, Amy, Andromeda, Aurore Boréale, Bob, Cedo Nulli, Drin Drin, Fairest of the Fair, Florence, General Canrobert, Golden Aurore, Hélène, Innocence, Judy, Little Beauty, Madame Eugène Domage, Madame Marthe, Madge Wildfire, Miranda, Miss Julia, Mrs. Dix, Mrs. Turner, Président Decaisne, Prince Kenna, Rose d'Amour, Rose Trevenna, St. Justia, Salamon, Stella, White Trevenna.

Japanese varieties for decorative purposes and exhibition. — Comet, Garnet, Cromatella, Dr. Masters, Elaine, Emperor of China, Fair Maid of Guernsey, G. F. Wilson, Giant, Grandiflora, James Salter, Jane Salter, Jupiter, Madame Godillot, Nagasaki Violet, Prince Satsuma, Red Dragon, Red Indian, The Daimio, The Mikado, The Sultan, Viceroy of Egypt, Wizard.

CINERARIAS.—Adam Bede, Agrippa, Brilliant, Blue Beard, Duke of Cambridge, Eclipse, Flower of Spring, Ino, James Andrew, Lord Amberley, Lord Elgin, Magenta, Maid of Honour, Orb of Day, Pandora, Perfection, Prince of Wales, Queen Victoria, Reynolds Hole, Royal Purple, Snowflake, Uncle Toby, William Reeves.

CLIMBING PLANTS FOR ROOFS AND PILLARS.—Acacia dealbata, A. pubescens, A. Riceana, Bignonia grandiflora, B. speciosa, Clematis lanuginosa pallida, C. Star of India, C. Alexandra, C. Miss Bateman, C. John Gould Veitch, C. Jackmanni, C. Prince of Wales, C. Mrs. James Bateman, C. Lady Londesborough, C. Lord Londesborough, Cobæa scandens variegata, Gompholobium polymorphum splendens, Habrothamnus elegans, Kennedya coccinea, K. monophylla, K. rubicunda, Jasminum grandiflorum, Lapageria albiflora, L. rosea, Lophospermum Hendersoni, Mandevillea sauveolens, Passiflora Impératrice Eugénie, P. Lawsoni, P. racemosa cœrulea, Plumbago capensis, Rhynchospermum jasminioides, Solanum jasminioides, Sollya Drummondi, Tacsonia eriantha, T. Exoniensis, T. Van Volxemi, Tecoma jasminioides alba magna, T. j. rosea, Solanum jasminioides, Tropæolum Cooperi, *T. Crimson Model.*

CYCLAMEN PERSICUM.—Atropurpureum album, Carneum, Coccineum, Delicatum, Grandiflorum, Marginatum, Odoratum, Pallidum, Purpureum, Roseum coccineum, Roseum odoratum, Superbum.

EPACRIS.—Alba odorata, Butterfly, Campanulata, Carminata, Coccinea major, Delicata, Eclipse, Exquisite, Grandiflora rubra, Hyacinthiflora, Hyacinthiflora candidissima, Hyacinthiflora carminata, Hyacinthiflora fulgens, Impressa alba, Impressa carnea, Lady Alice Peel, Lady Panmure, Lucifer, Miniata splendens, Mont Blanc, Mrs. Pym, Princess Royal, Queen Victoria, Rosea elegans, the Bride, Viscountess Hill.

ERICAS.—Aitoniana, Aitoniana Turnbulli, Amabilis floribunda, Ampullacea, Ampullacea elegans, Ampullacea vittata, Aristata major, Austiniana, Campanulata, Candolleana, Cavendishiana, Colorans, Depressa multiflora, Devoniana, Elegans, Eweriana superba, Eximea, Fairreana, Favoides elegans, Ferruginea, Gracilis autumnalis, Gracilis vernalis, Hybrida, Hyemalis, Intermedia, Jacksoni pallida, Jasminiflora alba, Lambertiana, Mammosa major, Marnockiana, Obbata, Parmentieriana rosea, Retorta major, Shannoniana, Tricolor coronata, Tricolor elegans, Tricolor impressa, Tricolor Wilsoni, Turnbulli, Ventricosa Bothwelliana, Ventricosa coccinea minor, Ventricosa superba, Vestita rosea, Willmoreana.

FERNS.—Adiantum affine, A. cuneatum, A. formosum, A. hispidulum; Alsophila australis, A. excelsa, A Leichardtiana; Asplenium bulbiferum, A compressum, A lucidum; Balantium culcita; Cibotium Barometz; Cyathea dealbata, C. medullaris, C. princeps; Cyrtomium falcatum; Davallia canariense, Dicksonia antarctica, D. squarrosa, D. Youngi; Lastrea patens, L. Standishi; Lomaria capensis, L. chilinese; Nephrodium molle corymbiferum, Nephrolepis tuberosa, Polypodium drepanum, P. trichodes, Polystichum ordinatum, P. setosum; Pteris scaberula, P. serrulata angustata, P. s. cristata, P. straminea, P. tremula, P. umbrosa, P. scaberula; Woodwardia japonica, W. orientalis, W. radicans, W. virginica.

FUCHSIAS.—*Single varieties with dark-coloured flowers.*—Alderman Mechi, D. T. Fish, Warrior Queen, Beauty of Kent, Hercules, John F. McElroy, Splendour, King of the Stripes, Killiecrankie, Mr. Richard Pexton, Pride of Woolwich, Rt.

Hon. J. Bright, Crown Prince of Prussia, Perfection, Striata splendens.

Single varieties with light-coloured flowers.—Arabella Improved, Baroness Burdett-Coutts, Minnie Banks, Marginata, Lustre, Leah, Guiding Star, Madlle Tietjens, Princess Beatrice, Rose of Denmark.

Double varieties with white corollas.—Enchantress, Marchioness of Anglesey, Our Future King, Avalanche (Smith's), Princess of Wales, Carry Symes.

Single varieties with white corollas.—Cannell's Gem, Conspicua, Puritani, Mrs. Bland. Mrs. G. Bennett, Picturata, Floribunda.

Dark-flowered varieties with double corollas.—Alpha, Albert Memorial, Champion of the World, Avalanche (Henderson's), King of Doubles, Blue Beauty, George Felton, Harvest Home, Marksman, Purple Prince.

Varieties with variegated foliage.—Meteor, Pillar of Gold, Gracilis fol. variegata, Regalia, Golden Treasure, Wave of Life, Sunset.

HARD-LEAVED PLANTS FOR THE CONSERVATORY.—Agave americana, A. americana medio-picta, A. applanata, A. Besseriana candida, A. celesiana, A. coccinea, A. ensiformie, A. filifera variegata, A. gemiflora filifera, A. Ghiesbreghti, A. grandidenta, A. horrida, A. macrodontha, A. Noachi, A. Salmiana, A. Saundersi, A. Schidigera, A. Verschaffelti; Aralia crassifolia, A. leptophylla, A. macrophylla, A. quinquifolia, A. Sieboldi, A. papyrifera; Araucaria Bidwilli, A. Cunninghami, A. excelsa; Beaucarnea glauca, B. recurvata, B. stricta; Cordyline indivisa; Cycas circinalis, C. revoluta; Dasylirion acrotricum, D. latifolium, D. plumosum, D. serratifolium; Dracæna australis, D. cannæfolia, D. indivisa, D. indivisa atrosanguinea, D. indivisa Veitchi, D. rubra; Encephalartos Altensteini, E. caffer, E. horrida, E. villosa; Grevillea Hilli, G. longifolia, G. robusta; Lomatia Bidwilli, L. ferruginea, L. heterophylla; Phormium tenax, Rhopala corcovadense, R. elegantissima; Yucca albo spica, Y. aloifolia, Y. concava, Y. De Smetiana, Y. filamentosa, Y. filifera; Zamia purpurea.

HARD-WOODED PLANTS FOR THE GREENHOUSE.—Abutilon Duc de Malakoff, A. venosum, Acacia armata, A. Drummondi, A. grandis, A. longifolia magnifica, A. platyptera,

A. pubescens, A. pulchella, Acrophyllum venosum, Adenandra fragrans, A. speciosa, Andromeda formosa, Aphelexis humilis, A. macrantha purpurea, A. rupestris grandiflora, Beaufortia purpurea, Begonia Boliviensis, B. Martini (diversifolia), B. rosæflora, B. Veitchi, Blandfordia aurea, B. Cunninghami, B. flammea, B. nobilis, Boronia Drummondi, B. pinnata, B. serrulata, Brugmansia Knighti, B. suavolens, Burchellia capensis, Cantua dependens, Cassia corymbosa, Chironia frutescens, Chorozema cordata splendens, C. Henchmanni, C. Lawrenceana, C. varia Chandleri, C. varia nana, Clianthus Dampieri. C. puniceus, Clivea nobilis, Coleonema rubra, Coronilla glauca, Correa Brilliant, C. cardinale, C. Harrisi, C. magnifica, C. speciosa ventricosa, Crowea saligna, C. stricta, Cytisus Atleeana, C. racemosa, C. Everestiana, Daphne indica alba, D. indica rubra, Dillwynia Drummondi, D. splendens, Dracophyllum gracile, Embothrium coccineum, Eriostemon buxifolium, E. intermedium, E. nerifoleum, E. pulchellum, Erythrina cristagalli, E. floribunda, E. Marie Belanger, Eupatorium odoratum, E. riparum, Gastrolobium Drummondi, G. Hendersoni, Gastronema sanguinea, Genetyllis Hookeri, G. tulipfera, Gompholobium polymorphum splendens, Hovea Celsi, H. pungens major, Imatophyllum cyrtanthæflorum, I. miniatum, Indigofera decora, I. floribunda, Kalosanthes coccinea superba, K. Madame Celeste Wynans, K. Phœnix, K. miniata grandiflora, Leptospermum bullatum, L. grandiflorum, Leschenaultia Baxteri major, L. biloba grandiflora, L. formosa, L. splendens, Leucopogan Cunninghami, Libonia floribunda, Linum flavum, L. trigynum, Luculia gratissima, Magnolia fuscata, M. Lenne, Mirbella Baxteri, Mitraria coccinea, Monochætum ensiferum, M. Lemoineanum, M. sericeum multiflorum, Myrtus communis angustifolium, M. communis latifolium, Nerium album plenum, N. rubrum plenum, N. splendens giganteum, Olea fragrans, Oxylobium Browni, O. Osborni, Phænocoma prolifera Barnesi, Pimelia decussata, P. elegans, P. Hendersoni, P. mirabilis, P. spectabilis, Pleroma elegans, P. sarmentosa, Podolobium elegans, P. Hugeli, Polygala cordata, P. Dalmaisiana, P. oppositifolia, Pultenæa retusa, P. punica granatum, Richardia æthiopica, R. alba maculata, Statice Halfordi, S. macrophylla, S. profusa, Swainsonia Greyana, S. lessertifolia, S. Osborni, S. purpurea, Tetratheca ericoides, T. hirsuta, Thea Bohea, Thibaudia macrantha, T. pulchra, Vaccinium erythninum, V. Rollissoni.

HELIOTROPIUMS.—Caroline de Antoines, Emilie Angier, Étoile de Marseille, Jersey Beauty, La Favorite, Madame Boucharlet, Madame Chauvière, Madame Fillion, Modèle, Monsieur Hamaitre, Souvenir J. B. Rendatler, Voltaireanum.

LANTANAS.—Adolphe Hwass, Alba lutea grandiflora, Delicatissima, Dom Calmet, Empereur des Française, Fillioni, Julius Cæsar, Madame Boucharlet, Madame Bruant, Marcella, Monsieur Rougier, Raphael, Roi des Rouges, Solfaterre, Triumph, Victoire.

MIMULAS.—Pardina and Quinquevulnerus sections, Albus elegantissimus, Attraction, Beauty, Constellation, Inimitable, Leopardinus, Distinction, Enchantress, Goliah, Illustration, Magniflorus, Orientalis, Prince of Wales, Regulator, Regulus, Unique; Cardinalis section, Coccinea, Orange Perfection, Rose Queen, Tricolor; Diplacus section, Atropurpureus, Golden Pheasant, Lord Derby, Punicea aurantiaca, Sunbeam, Nana.

ORCHIDS.—Barkeria Lindleyanum, B. Skinneri, Brassavola glauca, Brassia verrucosa, Cattleya citrina (this does best fastened to a block, and suspended with the foliage downwards, as it grows in its native habitat on the under side of branches of large trees), C. Mossiæ, C. Trianæ, Cœlogyne cristata, C. speciosa, Cymbidium giganteum, Cypripedium insigne, C. venustum, Dendrobium chrysanthemum, D. heterocarpum, D. nobile, D. speciosum, Disa grandiflora, Epidendrum atropurpureum, E. erubescens, E. macrochilum, E. vitellinum, Lælia acuminata, L. albida, L. autumnalis, L. majalis, L. superbiens, Lycaste aromatica, L. cruenta, L. Skinneri, Masdevallia Harryana, M. ignea, Maxillaria Harrisonii, Odontoglossum cerventesi, O. citrosmum, O. grande, O. Insleayii, O. maculatum, O. nebulosum, O. pulchellum, O. Rossii, Oncidium crispum, O. flexuosum, O. leucochilum, O. pulvinatum, Pleoine maculata, Sophronitis cernua, S. grandiflora, Stanhopea insignis, S. oculata, S. Wardii, Trichopilia tortilis, Zygopetalum crinitum, Z. Mackayii.

PALMS.—Areca aurea, A. lutescens, A. monostachya, A. sapida Brahea dulcis, Chamædorea glauca, Chamærops excelsa, C. Fortunei, C. Ghiesbreghti, C. humilis; Cocos australis, C. coronota, C. flexuosa, C. Wallisi, Corypha australis, Jubæa

spectabilis, Latania borbonica, Livistonia australis, L. humilis, Phœnix dactylifera, P. farinifera, P. reclinata, P. tenuis; Rhapis flabelliformis, R. flabelliformis aureo-variegata; Sabal Adamsoni, Seaforthia elegans, S. Veitchi; Syagrus amara, S. campestris, S. Mikaniana; Thrinax parviflora, T. tunicata; Trithrinax mauritiæformis.

PELARGONIUMS.—*Large-flowering Varieties.*—Achievement, Beacon, Blue Bell, Brigand, Emperor, Chancellor, Charlemagne, Charles Turner, Cæsar, Corsair, Duchess, Duke of Edinburgh, Harold, Hebe, Hermit, Heroine, Kingcraft, Lady of the Lake, Lord Clyde, Lord Napier, Maid of Honour, May Day, Milton, Mary Hoyle, Mr. Rassam, Nabob, Naomi, Olivia, Orange Spot, Pompey, Pollie, Prince of Denmark, Prince of Wales, Progress, Queen of Roses, Robin Hood, Rosicrucian, Ruth, Shakespeare, Troubadour, Warrior, Woman in White, William Hoyle, Zephyr.

PELARGONIUMS.—*Large-flowering Fancy Varieties.*—Ann Page, Belle of the Season, Brightness, Ellen Beck, Miss-in-her-Teens, Arabella Goddard, Leotard, Delicatum. East Lynne, Excelsior, Fanny Gair, Silver Mantle, Miss Dorling, Cloth-of-Silver, Duchess of Buccleuch, Excelsior, Marmion, Madame Sainton-Dolby, Andromeda, Lady Carrington, Mrs. Mende, Mr. A. Wigan, Lady Dorothy Neville, Princess Teck, Undine.

PELARGONIUMS *Spotted and French Varieties.*—Alphonse Duval, Brutus, Dr. Audry, Empress, Fair Rosamond, L'Cygne, Kingston Beauty, Lictor, Madame Charles Keteleer, Mons. Boucharlet, Nabob, Nigricans, Pickles, Prince of Pelargoniums, Rubens, William Bull.

PELARGONIUMS.—*Golden Zonals.*—Turner's Achievement, Alice Maude Mary, Countess of Flanders, Colonel Lloyd Lindsay, Empress, Gem of Tricolours, Howarth Ashton, Lady Cullum, Lucy Grieve, Macbeth, Miss Batters, Miss Goring, Mr. Rutter, Mrs. Grieve, Mrs. Headley, Peter Grieve, Prince Arthur, Prince of Wales, Rev. E. R. Benyon, Sir Robert Napier, Sophia Dumaresque, The Moonstone.

Silver Zonals.—Banshee, Mrs. Carr, Mrs. Laing, Mrs. Colonel Wilkinson, Mrs. Rousby, Caroline Longfield, Excellent Lady Dorothy Neville, Lady B. Brydges, Marchioness, Miss Pond, Mrs. J. Clutton, Miss Burdett-Coutts, Mysterious Night,

Lass o'Gowrie, Impératrice Eugénie, Peri, Princess Beatrice, Glen Eyre Beauty, Mabel Morris, Mrs. K. Wynn, Queen Victoria.

Bronze Zonals.—Black Douglas, Black Knight, Criterion, Danäe, Earl of Rosslyn, Fairy Ring, Harold, Harrison Weir, Impératrice Eugénie, Marquis of Lorne, Mrs. John Lee, Princess of Wales, Reine Victoria, Rev. C. P. Peach, St. John's Wood Star.

Zonals classed in colours.—Scarlet Shades.—Circulator, Coleshill, Corsair, Diana, Duke of Portland, George Peabody, Iago, King of the Forest, Master Harry, Harry King, Mr. H. M. Stanley, Renown Improved, Richard Headly, Sir John Moore.

Purple Shades.—Heartsease, Ianthe, Madame Mezard, Mr. Chandler, Purple Prince, Truth.

White with Pink Centre.—Alice Spencer, Bride (Bull), Gloire de Corbeny, Madame Werle, Mrs. George Gordon, Miss Gladstone.

Salmon Shades.—Acmé, L'Aurore, Madame Jean Sisley, Polly King, President Thiers, Mrs. H. Fenn.

Pink Shades.—Amaranth, Blue Bell, Florence Durand, Forget-Me-Not, Marchioness, Master Christine, Mrs. F. Burnaby, Mrs. Keeler, Richard Wallace, Rose Bradwardine.

White.—Maiden's Blush, Mrs. Sach, Madame F. Hock, Souvenir d'Etinnie, White Wonder.

Ivy Leaves for Baskets and Vases.—Cassidy, Dr. Schomburgk, Elegans, Emperor, Favonia, Peltatum Elegans, Gem of the Season, Lady Edith, Romance, Willsi, Willsi Rosea.

PETUNIAS.—*Single*—Desdemona, Essential, Hebe, Imperial, Isabel, Maggie Cochrane, Northern Star, Othello, Perdita, Royalty, Sanspareil, Spitfire, Single Beauty, Undine, Victorine, Volunteer.

Double—Bonnie Dundee, Bride, Coquette, Celebrity, Don Quixote, George Bruant, General Grant, Jeanne Donnat, King of Crimsons, Lady Moncrieff, Lord Derby, Laurence de St.-Lesseux, MacMahon, Madame Montesquion, Marquis de St.-Innocent, Marie Van Houtte, Monsieur Meyer, Oberon, Patroness, Petrel, Princess Louise.

PRIMULA SINENSIS.—*Single*—Carminata, Fimbriata alba,

Fimbriata rubra, Filicifolia alba, Filicifolia rubra, Lilacina albomarginata, Marquis of Lorne, Princess Louise, Rubra magnifica, Village Maid, Waltham White.

Double—Alba plena, Alba plena fimbriata, Exquisite, Fairy, Empress, Emperor, Glen Eyre Gem, King of Purples, Lilac Queen, Magenta Queen, Magnifica, Mrs. Eyre Crabbe, Peach-Blossom, Princess of Wales, Rubella superba, Rubra grandiflora, Victoria.

RHODODENDRONS.—Album, Arboreum, Barbatum, Brooki gracilis, Calophyllum, Ciliatum, Countess of Haddington, Dennisoni, Edgeworthi, Formosum splendens, Gibsoni, Jasminiflorum, Javanicum, M'Nabi, Princess Alice, Princess Alexandra, Princess Helena, Princess Royal, Prince of Wales, Retusum, Veitchianum.

ROSES FOR GREENHOUSE CULTURE.—*Hybrid Perpetuals.*—Anna Alexieff, Anna de Deisbach, Abbé Bramerel, Alfred Colomb, Antoine Ducher, Beauty of Waltham, Baronne Prevost, Caroline de Sansal, Charles Lefevre, Dr. Andry, Duc de Rohan, Duchesse de Caylus, Duchess of Sutherland, Duke of Edinburgh, Elizabeth Vigneron, Etienne Levet, Firebrand, Géant des Batailles, General Jaqueminot, Jules Margottin, La Reine, Madame Charles Wood, Madame Clemence Joigneaux, Madame Marie Cirodde, Madame Alice Dureau, Madame Lacharme, Madame la Baronne de Rothschild, Madame Victor Verdier, Madlle. Marie Rady, Madlle. Thérèse Sevet, Marie Bauman, Marquise de Castellane, Marquise de Mortemart, Maurice Bernardin, Michel Bonnet, Monsieur Boncenne, Paul Neron, Paul Verdier, Pierre Notting, Prince Camille de Rohan, Princess Beatrice, Princess Christian, Princess Mary of Cambridge, Princess of Wales, Souvenir de Poiteau, Sénateur Vaisse, Star of Waltham, Vicomte Vigier, Victor Verdier, William Griffith.

Bourbon Perpetual.—Catherine Guillot, Emotion, Madame de Stella, Madame Gustave Bonnet, Modèle de Perfection, Rev. H. Dombrain.

Tea-scented.—Abricoté, Alba Rosea, Bougère, Devoniensis, Gloire de Dijon, Homer, La Boule d'Or, Le Nankin, Madame Capucin, Madame Camile, Madame Celine Noirey, Madame de St. Joseph, Madame Falcot, Madame Margottin, Madame Villermoz, Madlle. Cecile Berthod, Marie Sisley, Marie

Van Houtte, Mon plaisir, Niphetos, Rubens, Safrano, Souvenir d'un Ami, Vicomtesse de Cazes.

Noisettes.—Bouquet d'Or, Celine Forestier, Earl of Eldon, Jane Hardy, Lamarque, Perle des Blanches, Solfaterre, Unique Jaune.

SALVIAS.—Fulgens, Gesnerifolia splendens, Splendens compacta, Splendens compacta alba.

SUCCULENT-LEAVED PLANTS.—The under-mentioned will form a very interesting and distinct selection:—Aloe ferox, A. plicatiles, A. caniculata; Cactus speciossimus, Crassula flava, C. Cooperi; Cereus flagelliformis, C. grandiflorus, C. McDonaldiæ, C. splendidus, Echeveria agavæoides, E. caleophena, E. californica, E. glauco-metallica, E. metallica, E. pulverulenta, E. racemosa, E. retusa, E. retusa floribunda, E. retusa fulgens, E. sanguinea, E. Scheeri; Echinocactus coccineus, E. multiflorus, E. streptocaulon; Gasteria maculata, G. striata; Kleinia repens, K. tomentosum; Mesembryanthemum cordifolium, M. cordifolium variegatum; Pachyphiton bracteosum, P. lingua; Rochea falcata, Sedum atropurpureum, S. azoideum, S. azoideum variegatum, S. carneum variegatum, S. dasyphyllum, S. Sieboldi variegatum, S. spectabile, S. spectabile variegatum, Sempervivum arboreum, S. arboreum atropurpureum, S. arboreum variegatum, S. Bolli, S. canescens, S. canariensis, S. glutinosa, S. Donckelaari, S. palma, S. phialoides, S. repens, S. tabulæforme, S. tomentosum.

TROPÆOLUMS.—Attraction, Ball of Fire, Brilliant, Crystal Palace Perfection, Mrs. Bowman, Triomphe d'Hyères; Vesuvius.

VARIEGATED PLANTS.—Abutilon Thompsoni, A. vexillarium variegatum, Aralia reticulata, A. Sieboldi aurea variegata, A. S. argentea variegata, Agave americana aurea variegata, A. a. variegata, Bambusa Fortunei variegata, Citrus aurantiacus variegatus, C. argenteus variegatus, Clethera arborea variegata, Coprosma Baueriana variegata, Coronilla glauca variegata, Dracæna Guilfoylei, Elæagnus japonicus variegatus, Eurya japonica latifolia variegata, Myrtus augustifolius variegatus, M. communis variegatus, Hydrangea japonica argentea variegata, H. japonica aurea variegata, Nerium Oleander variegatum, Osmanthus ilicifolius variegatus aureus, Phormium Colensoi, P. tenax variegatum, P. Cooki, P.

Veitchi variegatum, Smilax maculata, Veronica Andersoni variegata, V. alba marginata, Yucca aloifolia variegata, Y. filamentosa variegata, Y. quadricolor.

VERBENAS.—Anatole Leroy, Antoinette, Bizarre, Beauty of Deal, Carnation, Celestial Blue, Clara Perry, Conqueror, Edwin Day, E. W. Badger, Granville, Iona, John Laing, Lady Cowley, Lavender Queen, Lord Charles Perry, Masterpiece, Mauve King, Mauve Queen, Mrs. George Prince, Mrs. Reynolds Hole, Murillo, Otago, Parsee, Peter Williams, Queen of England, Rev. C. P. Peach, Rose Imperial, Storm King, Shakespeare, Sunshine, Thomas Lawden, Tinted Venus.

VERONICAS.—Adolar Herli, Alba lilacina, Andersoni, Azurea superba, Celestial, Crême et Violet, Gloire de Lorraine, Gloire de Lyon, Imperialis, Madlle. Claudine Villermoz, Princess Mathilde, Purpurea, Violacea, Rosea compacta, Rubens, Rubra elegantissima.



ALSTRÆMERIA ARGENTEO-VITTATA.

CHAPTER XXIII.

REMINDERS OF MONTHLY WORK.

JANUARY.—Shrubs to be forced should be taken to the greenhouse or to a warm pit first to prepare them, and the first thing needful is to thoroughly soak their roots, which are often very dry; see also that they are not heavily laden with flower buds, and that they are in proper trim as to training, &c., both to look well when in flower and to carry their blossoms safely. Hard-wooded plants must have fire-heat during frosty weather, but it must not rise above 40° at night, and 50° by day. Soft-wooded plants may be kept growing freely, but not at a high temperature, which is exhaustive of plants, and productive of red spider. Hang strips of worsted netting over the ventilators, to break the force of cold winds. Revise sticks and labels and wires used for training, &c., and complete various odd jobs to leave all clear for the hurry of spring work. Keep succulents quite dry. The principal flowers now are salvias, jasminum nudiflorum, fuchsias, cinerarias, primulas, genistas, deutzias, crocuses, and hyacinths. To succeed these there should be in the forcing pit or stove kalmias, azaleas, camellias, rhododendrons, lilacs, weigelias, daphnes, roses, double-flowering plums and peaches, and Andromeda floribunda. Therm. 45° average, varying from 35° by night to 55° by day.

FEBRUARY.—Fire-heat may be used more liberally now, as there is more light, and many early subjects are advancing into bloom. Put cinerarias, primulas, and other soft-wooded, early blooming plants, as near the glass as possible, and where they can be freely ventilated on fine days. Give plenty of water to everything that is growing freely. Hard-wooded plants that have been kept dry all winter will probably need to be plunged to the rim of the pot in a vessel of tepid water,

to soften the ball of earth, and allow water to pass through freely. When this is not done in spring, it often happens that, having once got dry, the water never afterwards wets the roots properly, but runs away down the sides of the pots, and after languishing some time, the plants die altogether. Get all store plants from cutting pans and boxes potted off. Start old plants of bedders to get cuttings, and put in cuttings as soon as they can be taken, to have the bedders forward in time to plant out strong. With the rise of the thermometer there will be an increase of green fly, and plants with soft leaves will be attacked first. Look to the under sides of the leaves of the cinerarias, calceolarias, pelargoniums, &c., and, if any fly, put the plants together in a box and fumigate, or fill the house with smoke, and syringe next day. All hard-wooded plants coming into leaf to be freely syringed. Temp. 45° at night, 55° to 60° by day. Bottom-heat for cuttings, 60° to 70°.

MARCH.—Plants in bloom will require careful management on account of the drying and trying east winds and bright sunshine which occasionally occur at this time. Shading will be of great service in these cases, and if the walks and beds are frequently sprinkled there will be a genial moist atmosphere in the house when the air outside is filled with "March dust." This is a busy time with plant growers, and there must be no delay in shifting on all subjects that require increased root-room, for vegetation is now becoming active, and if plants make new roots in old exhausted soil it impairs their vigour and deteriorates their beauty. Pot Cape bulbs, liliums, gladioli; shift ericas; start fuchsias, and take cuttings. Camellias done flowering to be started into growth in a moist atmosphere and genial temperature. Give plenty of water, alternating with liquid manure, to pelargoniums, calceolarias, cinerarias, and other subjects advancing into bloom. Temp. 50° night, 60° to 65° day.

APRIL.—General collections should only have a moderate heat, and a strong healthy growth should be promoted by giving plenty of air, with a view to putting out the fires for the season. Many specimen plants will want liberal shifts, and all subjects not immediately required in flower should be regularly and frequently stopped, to induce bushy growth and form.

good heads. Water and liquid manure must be more freely given, and vigilant efforts must be made to keep down green fly and thrips. Many of the less tender things may be removed to cold pits, to increase the room for other things that want continued protection to make fine plants. Young stuff from the propagating-house should be potted as fast as rooted, and kept close till started afresh, and then be gradually inured to air and light, so as to be strong by the middle of May. All tropical plants required for summer blooming in the house should be got on without delay, and a quick growth promoted, so as to allow them as long a season as possible for blooming, and ripening their buds for next season. Average temperature this month, 55° by night, 60° to 65° by day. Where desirable, the house may be shut up with sun-heat, to render fire unnecessary.

MAY.—Hard-wooded plants will want plenty of air, and specimen plants in flower must have shade. Allow nothing to form seed, unless seed be specially desired. Cut back all kinds of shrubs that are out of shape, and keep them rather close afterwards, to get good breaks, so as to bring them into decent shape, and get the wood well ripened for next year's bloom. Where plants are crowded, many may be removed to frames, so as to allow of a freer circulation of air. Shift, stop, and tie out all the soft-wooded plants that are advancing in growth; but if required to bloom shortly they must not be disturbed, merely kept in shape, and have plenty of water and free ventilation. Continue to strike bedding stock for late blooming. Fuchsias, geraniums, verbenas, and petunias make beautiful specimens for pot blooming in the autumn, if struck now and kept regularly stopped till July. They should not have a high temperature, fuchsias especially, which like shade and moisture. Camellias and azaleas that have made their young shoots should have a little more ventilation to prepare them to go in the open air next month to ripen their wood. Pelargoniums out of bloom to be cut in and allowed to break before repotting them, and the syringe and fumigator kept in use, as may be necessary, to destroy red spider and green fly. Fire-heat should be dispensed with as much as possible, preparatory to clearing and cleaning out the house.

JUNE.—To prolong the beauty of plants in flower, put up a

shading of tiffany or hexagon net; the latter will also be useful to exclude bees and wasps, for flowers on which bees have settled perish sooner than those they have no access to, owing to their disturbing the pollen, and causing a formation of seed-pods. A method of prolonging the bloom of flowers, and, in the opinion of some, increasing their beauty, is to get some dissolved gum arabic and a camel's hair brush. The brush is dipped in, and the centre of every flower touched with gum, where it forms a bright bead, and prevents the distribution of the pollen. Of course the flowers should be touched soon after they open, or Nature may have accomplished her end before the preventive is brought into operation. Pelargoniums done blooming should be cut in and allowed to break before repotting. They should be kept rather dry, so as to break slowly, and when potted into small pots put in a cold frame, and kept close till they begin to make fresh root, when they must have plenty of light and air. Cinerarias done blooming may be propagated by side shoots and suckers; if the plants are turned out on a border, and heaped round the collar with sandy loam, they will throw out suckers, which may afterwards be slipped off with a portion of root attached. The time is now arriving for clearing out the house, and giving it any necessary cleaning and repairs; and cold frames should be provided in good time to receive those plants that are not to be turned out of their pots for the summer.

JULY.—Shift all greenhouse plants required for late blooming, and grow them on to a good size before allowing them to blossom. Cinerarias for winter blooming must have good culture and shifts as required, and camellias may be shifted if necessary, but if well potted in the first instance they will flourish in the same pots for three seasons in succession, and to overpot them is to do them injury, from which they may never recover. Ericas generally require to be pruned and cleared of seed-pods and dead flowers. Put out all the ventricosas in the open air in a north aspect, and shelter with spare lights during heavy rain. All those with woolly leaves to be put in cold pits, and kept shaded at midday. Any not shifted in the spring cut in at once, and as soon as they break repot them. Repot leschenaultias. Every kind of hard-wooded plants may be repotted now if out of bloom.

AUGUST.—Pelargoniums that have been pruned back and rested should be repotted as soon as they have broken regularly. Put them into the smallest pots into which their roots can be got, so as to allow of a series of shifts till they are once more in their blooming-pots. Young plants and greenhouse shrubs should be well hardened now before going to their quarters for the winter. Let camellias and azaleas have plenty of sun and little water. Summer-struck geraniums, achimenes, and fuchsias, may be got into bloom now, to keep up a display till Christmas. Shift all forward stock required to bloom early. Cinerarias should now be strong and must have no check; see that they are kept clear of fly, for they are very subject to it. A cold pit is the best place for them. Sow now, for decorating the house in early spring, *Clarkia pulchella*, *Nemophila insignis*, *Erysimum Peroffskianum*, Œnothera roses, *Collinsia bicolor*, *Veronica syriaca*, and Chinese primroses. Whatever needs potting pot at once. Late shifts result in death during winter. All plants winter best when their pots are full of roots.

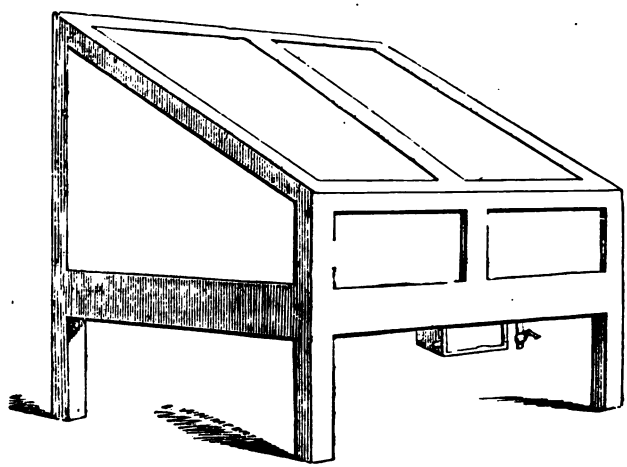
SEPTEMBER.—It is most important to have the growth of all hard-wooded plants well ripened when there is plenty of sun-heat. If any subjects requiring to be repotted have been neglected, there must be no time lost to give them a shift to enable them to make new roots before winter sets in. A border under a south wall is a good place for plants that require to be well roasted before being housed. Bedding plants should be got into small pots as fast as they make good roots in the borders, or can be spared from the decorative grounds, if worth keeping. Keep the houses gay with balsams, cockscombs, fuchsias, liliums, gladioli, coleus, amaranthus bicolor, heliotropes, and plants with fine foliage. Wherever wormcasts are seen in pots, turn out the balls, and the worms can then be picked out with a stick. Sometimes a dose of manure-water will cause the worms to struggle up to the surface. Plants in conservatory borders which are now past their best to be taken up, and, if worth keeping pot them, and place on bottom-heat for eight or ten days, as they will winter better if the pots are full of roots. Winter-flowering begonias to have a good shift in a compost of turfy loam and leaf-mould. Pot off a lot of bulbs *at once for* early bloom, and plunge them in coal ashes, and *give very little* water. Keep all houses open as much as will

be safe; house tender subjects that are likely to suffer from wind and rain. Pot a few bulbs for early bloom. Ornithogalum, lachenalia, ixia, and sparaxis force well, and narcissus bulbocodium will be useful if kept in ordinary greenhouse temperature for early bloom.

OCTOBER.—House at once whatever is to be wintered under glass. Remove the shading, give plenty of air, and whenever green fly or thrips appear, resort to effectual methods at once, and much future annoyance will be saved. Plants that are to bloom during the winter should have the best place as to warmth. Give plenty of air, day and night, and remove the shading, so as to let in all the sunshine that can be had. Avoid making up fires; but when it becomes necessary to do so, make a brisk fire, so as to dry the house and promote a current of air; otherwise, push nothing into growth more than may be needful to ensure vigorous health and plenty of stamina. Chrysanthemums will now keep the house gay for a while, and, as they go off, fuchsias and geraniums, from summer cuttings, may be got into bloom by giving the plants good places and shelter from draughts. If mildew appears, use flower of sulphur; for green fly, tobacco smoke. If aphides get possession of the tender crowns of cinerarias and fairy roses, and smoke fails to dislodge them, turn the plants upside-down into weak tobacco-water, and then lay them on their sides, and syringe them well with soft tepid water.

NOVEMBER.—There is great danger of overcrowding the plants newly housed, owing to the numbers that are propagated during summer. It would be better even to destroy surplus stock than to spoil a whole collection by cramming too many plants into a limited space. Give plenty of air, but guard against sudden night frosts. Withhold water as much as possible, to induce a state of rest in the plants, but allow nothing to get dust-dry, for that is an injury to the tender roots, on which the plant has to depend in a great measure to sustain itself. The first frost is generally severe; if by accident any plants get caught by it, keep them shaded, and occasionally sprinkled with cold water, but remove the shade as soon as they show signs of recovery. Fuchsias, late-struck geraniums, salvias, camellias, begonias, and chrysanthemums will now contribute greatly to the gaiety of the conservatory.

DECEMBER.—Chrysanthemums will keep the house gay till after Christmas, when the first lot of forced shrubs, especially azaleas, will come in to take their place. In the conservatory, whatever flowers are at command may be made the most of by judiciously intermixing with them good plants of yucca, acacia lophantha, camellias, and others possessing characteristic foliage. Hard-wooded plants in the greenhouse must have as much air as the weather will allow, and as little water as possible, as we may soon expect severe frosts. The thermometer should not descend below 38°. Soft-wooded plants will be subject to mildew if the house is at all damp, and must have fire-heat during foggy as well as during frosty weather. Shift any specimen plants that are in need of increased root-room. Ericas must have air at every opportunity, and if forced with other flowering shrubs, must have the coolest place in the forcing-pit, and be very gently stimulated. Greenhouse temperature, 40° to 45°.



PROPAGATING CASE FOR LAMP OR CANDLE.

CHAPTER XXIV.

GREENHOUSE VERMIN.

THE insects which infest the plants usually grown in the greenhouse are few in number, but capable of doing an immense amount of mischief if not kept under with a strong hand.

Those which occasion the most trouble are green-fly, black fly, thrips, red-spider, and scale. They are all more or less destructive, and when once they obtain a firm footing in the house are very difficult to eradicate. The first three are, perhaps, the most easily disposed of, as they can be effectually destroyed with tobacco-smoke, or by immersing the plants in tobacco-water. The other two are the most persistent, and a considerable amount of labour and perseverance will be found necessary, as they cannot be dispersed with tobacco-smoke. First of all, it is necessary to consider what the most favourable conditions are for the development of these pests, and these may be said to consist in a dry and confined atmosphere, and an unhealthy state of the plants, especially when brought about by neglect in watering. In fact, it is the easiest matter possible to produce a swarm of green-fly, or to have the foliage of the plants smothered with red-spider, for it is simply necessary to neglect the air-giving and watering for a few days to ensure either of these results. Allow the ventilators to remain closed for two or three hours every day after they should be opened, and insufficiently supply the plants with water, and the cultivator will soon be supplied with sufficient work to employ his head and his hands, and, moreover, tax his patience, for, probably, the remaining part of the season. The opposite of these conditions will, it may be readily imagined, promote a vigorous growth, and check the development of these pests. With a careful system of watering and proper attention to air-giving, there will not be much trouble with either green-fly or red spider. The keeping

of unhealthy plants is one of the chief sources of the vexatious mischief done in the greenhouse; and if the amateur would have the moral courage to utterly destroy all plants as soon as they are out of condition there would not be one half the trouble in keeping the occupants of the greenhouse clean. Therefore, if a plant has from any cause become unhealthy, throw it away to make room for others, and thus prevent its being the means of spreading destruction on all sides.

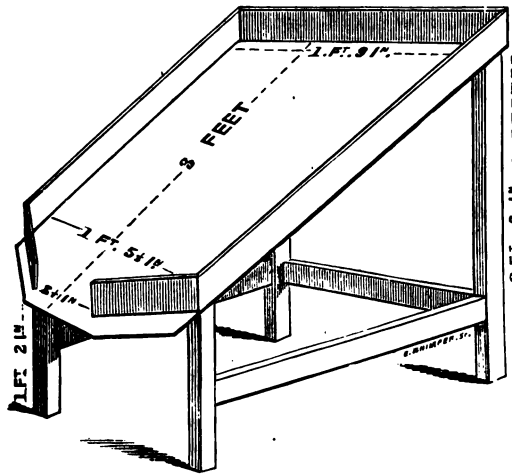
FUMIGATING with tobacco-paper or tobacco itself is the grand remedy for green and black fly and thrips, but, as it may not always be desirable to fumigate the house, dipping must in some cases be resorted to. Tobacco-paper is cheaper than tobacco, and the cheapest and most powerful tobacco is common shag. A quarter of a pound will suffice to fumigate a medium-sized structure. In using tobacco-paper, it must be made moderately moist; when quite dry, it will burst into a flame and scorch the foliage, but if made too moist it will generate steam, and not be so effective as it otherwise would be. In the preparation of the paper, pull it into small pieces, and separate all that is pressed together singly, and then sprinkle it with water if it requiries moistening. There are several forms of fumigators, but the best is Dreschler's, for by its means the houses can be filled with smoke from the outside. Appleby's is a simple contrivance, but it does not appear to present any material advantages over the common flower pot, excepting that it is more easily moved about, and not liable to be split with the heat. When a flower pot is used, knock a hole in the side, about an inch from the bottom, and place a few glowing cinders in the bottom; upon these sprinkle a handful of dry brown paper, then a handful of dry tobacco-paper, and when it bursts into a flame commence to fill the pot with the moistened papers, and take it into the house, and blow it steadily to get it fairly lighted. The grand point is to make a good start, for it will then burn freely without much further attention, and render it quite unnecessary to remain in the house the whole of the time. A sharp look-out must be maintained from the outside, and if it shows signs of bursting into a flame stir up the unconsumed materials and damp it slightly; add fresh if the house is only partly filled with smoke. In practice it will be found more desirable to *keep the paper* burning briskly until the house is filled, and

then take the pot out of the house, and remove the unconsumed portion; for when it is allowed to burn nearly out, and then left in the house to smoulder, there is a danger of a portion of the paper becoming quite dry, and then bursting into a flame. In using Dreschler's fumigator the paper must be ignited in exactly the same manner as in the flower pot, and until it is fairly alight turn the handle connected with the cage rather quickly, but afterwards it must be turned slowly.

Let the foliage of all plants be quite dry when fumigated, for when moist it is invariably more or less injured by the smoke. The evening of a still day is the most suitable for the work, as the house can remain closed for at least twelve hours afterwards. All openings must be closed, and the roofs of small structures and pits covered with mats or canvas, to prevent the too rapid escape of the smoke. Usually two fumigations with an interval of one or two days between will suffice, but when the plants are badly infested with thrips it will be necessary to fumigate three times on alternate days. In the morning after the house has been fumigated give the plants a thorough syringing to wash off the dead insects, and to finish off those in a dying state. As the smoke will destroy the flowers in a wholesale manner, all plants in bloom which it is desired to preserve must be removed.

Dipping.—Clear water is the most valuable insecticide, for when the plants are syringed freely during the growing season there will not be much danger of their being infested with green-fly or any other pests. Hot water is remarkably efficacious, and any soft plant may be dipped into water heated to 120° Fahr., while plants of harder texture may be dipped in water at 140°. Gishurst compound, prepared according to the patentee's directions, is perhaps one of the most effectual and the cheapest of the preparations. Tobacco-water, which can be made by steeping good shag tobacco in boiling water for a few hours, is efficacious and easily made. A little size mixed with any of the liquid mixtures will ensure its adhering to the foliage, and it will do no harm if the plants are thoroughly syringed the following day. Large plants must be syringed, but for those of small or medium size *sufficient* should be made to admit of their being immersed, for every portion of the foliage will then be thoroughly moistened, and all real waste prevented, provided, of course, the plants are held over the

dipping tub a short time. Quassia chips steeped in water, at the rate of two ounces to the gallon, make a most effectual liquid for destroying green and black fly. Large-leaved plants badly infested with thrips or red spider will require sponging with either Gishurst compound or tobacco-water. It will be tedious work, but unless it is done effectually it would be better to destroy the plants instead of leaving them to form a rendezvous for the pests with which they are infested.



DRENCHING BOARD FOR CLEANSING PLANTS.

The subjoined figure of a drenching board will suggest a simple means of economising any liquid preparation employed for cleansing plants. The plant is laid on the board, and the syringe is used with some force upon it, and a pail being placed in front, a considerable proportion of the fluid is caught for further use and none of it is conveyed to the roots. A carpenter would make such a board for ten shillings or less.

TOBACCO-POWDER is one of the best remedies for green-fly and black-fly, if applied in a proper manner. First of all, stand the plants to which the powder is to be applied on one side by themselves, sprinkle them with water, and dust the *foliage liberally* with the powder. The puffs sold by the trade

are most useful, for with their aid the powder can be applied to the under side of the leaves more readily. The powder will injure the foliage if left on too long; twenty-four hours will, as a rule, be found the proper time for it to remain, and at the end of that period wash it off with the syringe and clear water, and in a few days afterwards dust the foliage again, if the first application has not been sufficient to annihilate the fly.

CHAPTER XXV.

A RUSTIC PLANT-HOUSE.

In the garden of our neighbour, J. T. Pickburn, Esq., Stoke Newington, has recently been built a structure combining a plant-house and smoking-room, the whole of which is encased in a rockery, as shown in the accompanying figures. The walls consist of a large body of earth enclosed between two facings of brickwork, proper bricks being used on the inner side to accommodate the glass and carpentry, but on the outside rough "burrs," such as are commonly employed for rockeries in the neighbourhood of London, are employed. The whole of these rough walls are planted with ferns, ivies, and hardy succulents, the result being that the walls themselves constitute a somewhat extensive and eccentric garden.

The plant-house is lighted by windows in the walls and an elegant lantern roof. The entrance to it from the smoking-room is fantastically decorated with "virgin cork." From this rustic doorway the view of the house is novel and pleasing. The roof is furnished with a number of elegant baskets, well filled with showy plants of suitable character, and the walk is terminated by a fountain, at the back of which is placed a number of pieces of looking-glass, which reflect and re-reflect the splashing of the water.

The whole of the structure was put up by Mr. Overall, Horticultural Builder, of 16, Shacklewell Lane, Kingsland.





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